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THREE YEARS' EXPLORATION IN FRANZ JOSEF LAND.*

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It was in August, 1873, that the island group afterwards known as Franz Josef Land was first accidentally discovered by the Austro-Hungarian Expedition under the leadership of Weyprecht and Payer. In endeavouring to pass round the northern end of Novaya Zemlya to discover the North-east Passage, their ship, the *Tegetthoff*, became beset in the ice, and, after drifting for twelve months, they came in sight of an entirely new land, and the floe upon which the ship had been crushed up was frozen to the land-ice of Wilczek island. The following spring Payer made three plucky and adventurous journeys up and in the neighbourhood of what he then named Austria sound. After a hard and perilous journey, they were able to beat a retreat to Novaya Zemlya in boats, leaving the ship to its fate on the shores of Franz Josef Land, being quite of opinion that the country was unapproachable by ordinary methods. Payer had reached the latitude of 82° 5′ north, and was under the impression that he had seen land still further to the north in and beyond the 83rd degree, and land to the north-west reaching almost as far. It was upon these observations that arctic authorities advocated this route as the best for exploring to the northward, and upon which I based my plans in the latter end of 1892. Unfortunately, our expectations in this respect were fated to disappointment by the non-extension of land to the north, and we had not been long in Franz Josef Land before we discovered that, instead of this region being of continental dimensions, as many supposed it to be, it is only an archipelago of comparatively small islands; and this

* Paper read at the Royal Geographical Society, November 8, 1897. Map, p. 212.

unfortunately quite upset the basis upon which my plans for pushing north were founded, which were to follow the land, and form depôts of provisions as far as it extended.

Mr. Leigh Smith, in 1880 and 1881, visited Franz Josef Land, and continued Payer's discoveries westward; but all this is well known.

It was in the latter end of 1892 that I first published my plans, which, I am glad to say, met with the approval of most arctic authorities. These embraced not only an advance in a northerly direction, but mapping-in of the coast-lines of Franz Josef Land, a thorough examination of that country, taking scientific observations, and making collections generally. These plans we have been able to carry out; and scientific observations, which I think I may be excused for describing as valuable, have been carried on uninterruptedly for three years. We have also practically completed the map of Franz Josef Land, and settled the Gillis Land question.

For some time the sinews of war were conspicuous by their absence, and little encouragement given to my expedition. Consequently, in 1893 I determined to take a journey to Yugor straits, with the object of exploring Waigatz island, and the Bolshoya Zemelskja tundra country to the south of it, and at the same time thoroughly test the equipment which I intended to use in Franz Josef Land. This I accomplished, extending my journey round the White sea and through Lapland, to enable me to see something of the methods of the Lapps, in addition to those of the Samoyeds, with whom I had been travelling. It was on this journey that I became acquainted with reindeer as draught animals, and also fell in with the hardy Russian ponies which did us such sovereign service in the Franz Josef Land expedition, and I should consider the trouble of that former journey amply repaid if meeting with these horses had been its only result. Horses can be used to very great advantage in arctic exploration, and I am more than satisfied with the results of my experiments with them. At Archangel I received a telegram to return immediately, as Mr. Alfred Harmsworth generously offered to provide the necessary and long-sought funds for my proposed expedition. I considered, however, that I was serving the interests of the expedition best by returning by the rather longer way, *viâ* the White sea and through Lapland.

The next five months were spent in hurried preparations. After my return to London, the *Windward* was bought and alterations effected. A log-hut was ordered and erected at Archangel, and furs purchased there for us by the energy and kindness of Mr. Henry Cooke, H.M.'s vice-consul. Sledges, ski, etc., and more furs were obtained for us in Norway by Mr. Alexander Nansen, the brother of the explorer, and Mr. Joseph Jeaffreson. Tinned foods of all kinds were selected with the help of Mr. Harkness, of Somerset House, and examined by me; but I

relied largely upon obtaining fresh meat in Franz Josef Land by shooting bears and walrus, as I consider fresh meat to be one of the greatest factors in procuring health. This expectation, I am glad to say, has been entirely fulfilled. With the help and advice of our medical man, Dr. Koettlitz, I am glad to be able to say that in three years not one of us had an hour's illness, and I never knew a single man knock off work on account of indisposition during that time. Through the help and advice of Dr. Koettlitz, all tinned meats used were carefully examined, either by him or myself, before being placed on the table, and anything in the least degree tainted was rejected, and placed on the roof to be out of the reach of the dogs. All water used for drink or in food was boiled, exercise was regularly taken daily, and, in addition to all this, we were always busy.

There is a popular impression that people in the arctic lead a life of hibernation, except when actually engaged in sledging; but such was certainly not the case with us, and I can safely say we were as busy, with scientific observations of all kinds, and work incidental to our life, as any men could be. It is to this I attribute our good health, and the happiness and cheerfulness of the party. I do not propose to dwell on our first two years in Franz Josef Land, as an account of the work done during these years has already been published in the *Geographical Journal* by Mr. Montefiore Brice.*

We left the Thames on July 12, 1894, in the steam-yacht *Windward*, calling at Archangel for our hut and furs, meeting with great kindness from everybody, from the governor downwards. Then we proceeded east, skirting the northern shores of Kolguev island to Khabarova, a Samoyed settlement on the Yugor straits, to take on board some fresh reindeer meat and our thirty dogs, which had been procured and brought there by a German named Ravin from the Obb river in Western Siberia. We then steamed north through the Barents sea, making for Bell island, Franz Josef Land. We found the ice lying exceedingly close to the eastward; but by keeping along the edge of the tight pack we followed a wide lane of water trending north in the direction of Cape Grant. On August 25 we sighted land in the neighbourhood of Cape Grant, being about 40 miles distant, but there our lead of water came to an end. Nothing but a tight pack, without a streak of water in it, lay between us and the land. For a fortnight we dodged about, endeavouring to get round to the back of the pack, but without success. Winter was rapidly coming on, bay ice was forming upon the sea, and we were being drifted to the westward. Things looked anything but promising, owing to the lateness of the season. However, fortunately a south-westerly gale sprang up, which opened up the ice, and on September 7 let us through into the land-water.

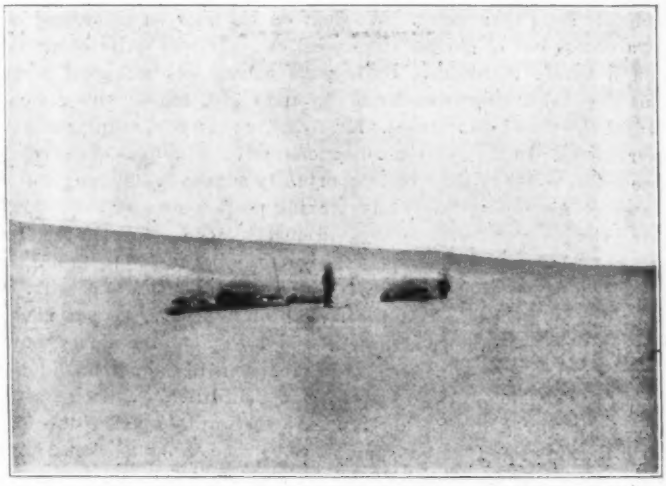
* *Geographical Journal*, vol. vi. p. 499; vol. viii. p. 543.

Meteorological, zoological, and other observations had been taken throughout the voyage. Eira harbour we found full of ice, so we steamed up Miers' channel, and looked for a suitable spot for putting up the hut and passing the winter. We here discovered a small island, a mile in length and half a mile in breadth, separated by half a mile of water from Bruce island, and consisting chiefly of weathered basaltic rocks. This I named Windward island—after our ship. Finding no suitable spot in this direction, we then steamed past the floe-edge to Cape Barents, which proved equally inhospitable. Here the rock consists mainly of columnar basalt. Collections of everything of scientific interest and observations of all kinds were made, and taken whenever possible; and our botanist, Mr. Harry Fisher, first found the curious vegetable life the alga, popularly called "red snow."

At this point I will endeavour to describe to you the general appearance of Franz Josef land. The mass of islands of which it is comprised consists of high glacier-land, rising to 2000 feet, covered with an ice-cap some hundreds of feet in thickness, and fronted along the shore by high perpendicular glacier faces, from 30 to 80 feet in height. At rare intervals high black basaltic rocks jut out of the ice near the shore, forming the only conspicuous landmarks. In front of these rocks the broken-down *débris* from the cliffs has formed a plateau or shore, upon which a certain amount of stunted arctic vegetation exists. Here may be found a few poppies, saxifrages, mosses, lichens, etc. Nothing grows higher than 6 inches from the ground. Everywhere else, with the exception of a few low islands, the ice-sheet dominates. Thick mists generally overhang this land; violent gales are frequent, combined with heavily falling and driving snow.

Finding no suitable site for our hut, we returned to Cape Flora, a high basaltic cape 1400 feet high, beneath which we pitched our camp, as being the most favourable spot we had yet seen, one of the strongest inducements being the presence of a large loomery in the high rocks, and the known presence of bears and walruses throughout the year. On September 8, after selecting as favourable a position as possible for the ship, we set to work to get our stores, etc., ashore, all hands working sixteen hours on and eight hours off, as I was anxious, if possible, to get the ship away again that autumn. The winter, however, came on with great rapidity, and three days afterwards the *Windward* was effectually frozen in for the winter. She was lying well out of reach of the driving pack, moving to the east with the flood-tide, and the west with the ebb. The current constantly moves in a westerly direction; the rise and fall off Cape Flora is about 17 inches, with a 3 to 4 knot flood-tide. She was also protected by two grounded bergs and an old floe to the eastward, together with a projecting rocky point. I did not, however, look upon her position as being too safe; but it was "Hobson's choice."

We at once set to work to shoot bears and walruses for the winter, to put up our log-hut—which I named "Elmwood"—and to make ourselves as comfortable as circumstances would allow. Our dogs, once landed, soon gave evidence that they had been on company behaviour when on board the ship. Carlo, a big retriever given me by Mrs. Harmsworth, opened the ball by killing one of the Ostiak dogs. He swaggered about among the pack, and exhibited all the supposed characteristics of the Britisher abroad. To check his homicidal, or rather canicidal, proclivities, I tied the dead dog round his neck. This, however, he evidently viewed as an excellent arrangement, especially devised for the arctic, where the food-supply is defective, and at once



WESTERN SIDE OF BRITISH CHANNEL. MARCH, 1897.

proceeded to make a cold lunch off his late adversary, looking up to me with grateful eyes, evidently thinking that it was very considerate of Jackson thus to provide him a larder right at hand. After this the dead dog was removed, and Carlo was always decorated with a muzzle. I afterwards made a good sledge-dog of him, but he could not stand the severe climate; and although the doctor made a blanket-coat for him, the poor old chap died sledging during the first fortnight in spite of it.

The rest of the pack were hardly less bellicose, but conducted their battles on lines hardly in accordance with civilized warfare. With the exception of two or three dogs, I always had the entire pack chained up, having taken out a large supply of English chains; but I found these quite inadequate to restrain these comparatively small dogs. One dog

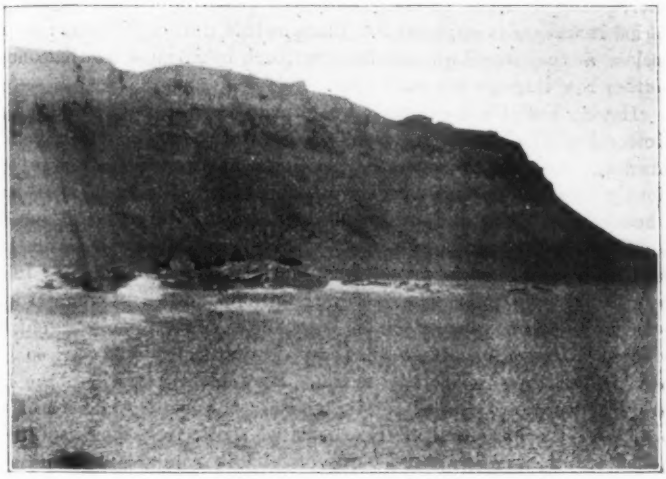
would break loose, and then commence a fight with another. The whole pack would become wildly excited, and one chain after another would snap, and all would then fall upon the losing combatant. The result would be another dead dog.

Our first anxiety, after putting up the house and getting the provisions ashore, was to obtain a sufficient quantity of fresh meat to keep ourselves and the crew of the *Windward* supplied throughout the winter. This we were fortunately able to do, and soon after the darkness closed in our larder was stocked with bears and walruses. Our hut was 20 feet long by 20 feet broad, 7 feet in height, double windows and roof, and consisted of pine logs a foot in diameter. Having some green baize with us, we used it for lining the walls, which gave the house an exceedingly snug appearance. We slept on the floor on skins, and made extra chairs out of old packing-cases, etc. It was quite comfortable, though hardly luxurious. During the winter meteorological observations were taken every two hours day and night, and for this reason we divided the time into watches. Mr. Armitage also took regular magnetic observations. In the autumn collections and examinations of the country were made, so far as time and opportunity admitted. Throughout the winter we were exceedingly busy making preparations for the following spring sledging, and with various jobs incidental to our life in the arctic, such as feeding and attending to the horses and dogs, and skinning bears and walruses, washing our clothes, and domestic duties generally. On the return of the sun, about the middle of February, we got ready to start, and on March 9 Mr. Armitage and I took a preliminary journey with the object of making a depôt of provisions to the north, and ascertaining the character of the travelling in that direction. Soon after our return, a severe gale of wind from the eastward broke up the ice in which the ship was frozen in, and for some time she was in considerable peril. This and other circumstances somewhat delayed our second departure. In the beginning of April, however, we started on our first march with three ponies and a number of sledges, being accompanied for the first week by Dr. Koettlitz and young Hayward, with one pony and sledges. But for details of this and subsequent journeys in 1895, I must again refer to the *Journal* of 1895, vol. vii. p. 499 *et seq.*

Returning from our summer journey, we reached Cape Flora on August 12, after being away thirty-three days, just in the nick of time, as on the following day the sea had become so full of ice that it would have been exceedingly difficult, if not impossible, to take the boat from Bell island. Observations for latitude and longitude were taken on all spots landed upon, and geological, botanical, and other collections and examinations were made. Meteorological observations were also taken throughout the journey, the heights of the various capes determined, and Cambridge bay and a little new country to the west were mapped in. As soon as we returned, we devoted our attention to getting ready for the

winter. I shot nearly 1300 looms, which we hung up round the house, and which remained frozen for the next nine months. A quantity of scurvy-grass was collected, which was placed in a berg, and also frozen, thus providing us with fresh salad twice, and sometimes three times, a week throughout the winter. The winter was passed comfortably and happily. We were busy the whole time with meteorological and other observations, which were taken every two hours day and night, in working out our bearings, etc., mapping and plotting out the map, and making preparations for the spring sledging.

Early in the following March (1896), Armitage, Blonkvist, and I again got under way, taking a team of dogs and one pony, for the latter



CAPE WILLIAM BRUCE AND CAMP. MARCH, 1897.

of which we had made snow-boots, which I found exceedingly satisfactory, keeping her from sinking into the snow. We pushed north through what I decided to name the British channel, correcting and adding to our map of the previous year, and mapping in Koettlitz island. I must again refer, for the details of this year's work, to the *Geographical Journal*, vol. viii. p. 543 *et seq.* For the first week, I may say, we advanced at a good rate of speed, and we—that is, Blonkvist, Armitage, and I—were all jubilant at the prospect of reaching a high latitude. Our hopes, however, were short-lived, for on the morning of April 6, after moving half a mile from camp in dense mist and snow, we were suddenly confronted with a large open sea of water, with nothing but exceedingly thin bay ice upon it. To endeavour to get round this we edged away to

the south-east, and when the sky cleared on the following morning we found ourselves encamped close to Cape Richthofen, in Alec Tweedie bay. This cape Mr. Armitage and I ascended. Again no Richthofen peak was visible in any direction, or anything approaching to the dignity of a mountain. Open sea lay before us, reaching from the high glacier-face below us to the western side of the British channel, where the water washed the ice precipices on that side. No ice could be seen except one solitary floating berg, the pack-ice having been driven off shore and clean out of sight by south-west winds. This endorsed my previous opinion that no land of any size lay to the north-west, and quite put out of my mind that King Oscar Land would be of any service as a means of getting north. A portion of this open sea near the land a few weeks later, owing to a fall of temperature, became frozen over, but at this period it was quite impassable. Boats at this time of the year are quite useless, as they would quickly become frozen in amongst ice that one can neither row through nor walk over.

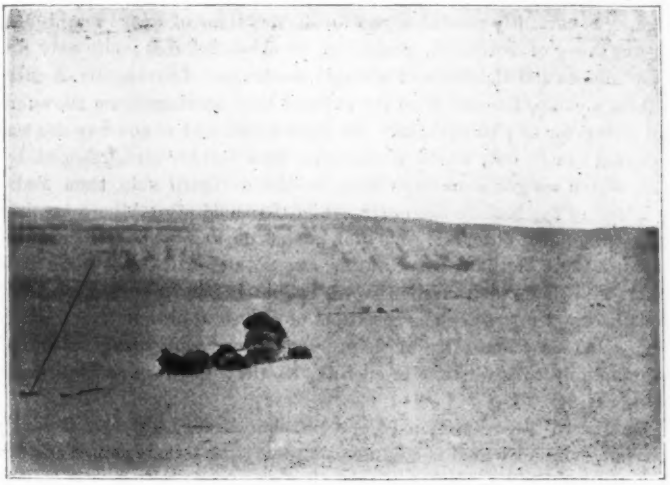
Having completed our task, we returned to the hut on Cape Flora. Meteorological observations were taken throughout the journey. Mr. Armitage took observations for position whenever the sky was sufficiently clear. Botanical, geological, and other collections were made whenever possible, and a considerable amount more coast-line was added to the maps. Franz Josef Land being chiefly basaltic, local attraction of the magnet was often considerable. The country in the neighbourhood of Markham, Vesey Hamilton, and Allan Young sounds consists of high basaltic cliffs, with high country behind entirely covered with ice. Scott Keltie island is quite devoid of ice; so likewise is a portion of Koettlitz island. Here and there, where the land is low and out of the sweep of the glaciers, the country is bare of ice; but, with the exception of these isolated spots, the whole country is glaciated, and a more arctic-looking country it is impossible to imagine. The western side of the British channel is one large glacier, and from Cape Forbes, Nightingale sound, to Cape John Murray, not even an isolated rock can be seen.

On our return to Cape Flora, we set to work to sledge driftwood from Cape Gertrude, 4 miles distant, most of which was very old, and had probably lain there some thousands of years, to judge by its position above sea-level. Our coal was running short, we only had a little dust remaining; so the driftwood mixed with blubber did good service for the stove.

Throughout the following autumn and winter we were always busy with our scientific work, preparing for the spring journeys and other tasks incidental to our life in the arctic. Tents were made, a canvas canoe, pony snow-boots, and so on.

In March, 1897, Armitage and I started with a team of thirteen dogs, the remnants of our pack, and our surviving pony. Our draught-

power had become reduced to a low ebb, and we greatly regretted we had not more dogs or ponies at our disposal. We pushed north up the British channel to go round the western land, to determine its limits, and, if possible, to settle the Gillis Land question. At an early stage in our journey our difficulties began. The pony broke loose the second night out, and, unfortunately, gorged herself with dried vegetables. These, together with dog-biscuits and a few pounds of oats saved from the previous sledging, were her usual fodder, owing to the lack of legitimate horse-food, which had quite run out more than twelve months before. As I expected, the surfeit of dried vegetables brought on a serious illness, to remedy which Armitage and I clubbed together the small supply of pills which we had with us. He produced, I think,



CAPE CECIL HARMSWORTH (AFTER LOSS OF PROVISIONS). MAY, 1897.

two varieties of pills, and I had a number of podophyllin; so we made up a dose of twenty-two in all, which I administered to our invalid pony, mixed up in some frozen fat from our frying-pan. This, I am glad to say, had the desired effect of, at all events, partly restoring her to health; and if I could have fed her upon oats or any legitimate horse-food, she would, I think, be alive now. The weather from the very outset was remarkably bad. Gales of wind, dense mist, and driving snow were almost constant. The floes were very heavy with deep snow, which, together with crushed-up, trappy ice, made travelling bad. Even at this early stage of the journey we had to go three times over the ground. Our pony, poor animal, owing to her illness, went very badly, and frequently lay down in the snow and refused to move. Armitage and

I would then take on separate loads with the dogs, and return for the others. During a very clear interval we found that Peterhead curves round further west than I had previously supposed. Nothing but glacier-face lined the coast, and the ice flowed down in curving lines as far as the eye could reach. Not even a bare stone was visible.

On the march we rounded Cape John Murray, which is about 300 feet in height, in a fresh gale. This I ascended, and found strewn with boulders, indicative of a raised beach. On that day we used sails on our sledges; it was the only day throughout the journey that we got a wind in our favour. On March 27 a new fjord appeared in view, with high basaltic rock, chiefly consisting of columnar basalt, jutting out of the glaciated land at its southern entrance. This I named St. Chad's Head. The cape appeared to consist of nothing but basalt. It is 400 feet high. I carefully searched, so far as the time of year would allow, for anything of botanical, geological, or other interest; but only found a few mosses and lichens, and a single saxifrage. Leaving Mr. Armitage to form a camp, I went off on my ski and took bearings from the summit and a number of photographs. At the western end of the bay the water appeared to run out, which observation was further strengthened by a view which we got some days later on the northern side, thus making an island of the land to the north, which I named after Albert Armitage, our astronomical observer. We then pushed on to a bold headland, which I named Cape William Bruce, after our zoologist. Capes Richthofen, Albert Markham, and Fisher were visible in the distance, and Cape McClintock dimly so. The position of Capes Richthofen and Fisher, being fixed astronomically by us previously, were of great help to me in mapping out this western coast-line, as they gave exceedingly good cross-bearings.

On March 28 we rounded Cape William Bruce, which also consists of basalt, some of which is columnar, and is 500 feet high. I ascended this cape while Mr. Armitage struck the camp, taking my camera, prismatic compass and stand, and other instruments with me. On the summit I took a round of angles and a number of photographs. I also made a cairn of stones, placing among the rocks a tin containing a record, a Union Jack, and a penny-piece, and on the top of the cairn another "Jack" on a bamboo staff. From the summit I could see plainly Mary Elizabeth island, Cape McClintock, and the surrounding coast. To the north I could make out two islands and a portion of a third, which appeared to be entirely ice-clad. To the west-south-west the land was very ill defined, which I found later was due to the exceeding lowness of the northern coast. It was, moreover, misty in that direction, and thus obliterated any definite view. To the north-west I could see the floes in a broken-up condition, with large pools of open water.

When detained by bad weather off Cape William Bruce, our second dog died, being simply frozen to death. I had examined them all an

hour or two previously, and they appeared to be all right. A little later I found one dog frozen as hard as a rock, and another one frozen down, which I had to hack out of the ice to get free. The weather became, if possible, worse than ever. Gales of wind and driving snow gave us no rest, with dense mist and temperatures as low as minus 46°. I saw a few rotges and dovekies flying about these rocks; collected a few mosses and lichens and one saxifrage, and in the tide-crack a piece of laminaria. The isolated bare spots of this side of the British channel appear to be very barren, scantily supplied with vegetation, and bird and animal life deficient. Since leaving Elmwood we had only seen one track of a bear. After being detained three days by persistent gales, we marched towards the neck of low land connecting the two portions of Albert Armitage island, but, finding the travelling over this land less favourable than I had anticipated, we determined to retrace our steps a few miles, and go to the north of it by rounding Cape Battenberg. We continued our march along the north-western coast, which we soon found to be low, without the high basaltic rocks which are such a conspicuous feature on the southern coast. On April 7 we reached the head of what we soon discovered to be Cambridge bay. We had been travelling along low undulating ground, which bore evidences of being an old beach, and had driftwood upon it. At this point the severe weather had killed all our dogs but five, and these were in a weak condition. The following morning I went on ski on to the ice of Cambridge bay, and took bearings and photographs of conspicuous points. Cambridge bay, I believe, runs out at its north-east corner, although I could not absolutely see the ice right through the narrow straits, but there is little doubt in my mind that it does so. Armitage took here an observation for double altitudes; and after packing up we continued our march with the pony—which was very weak and went badly—and our five remaining dogs. We still continued our march along the low land, and on the 10th were confronted by open water coming right up to the glacier face, which at this point began again. This obliged us to take to the high glacier land, and on the following morning we commenced what was a very laborious task, that of dragging the sledges up the steep incline on to the glacier itself. This day we nearly lost our pony and two sledges. Suddenly, without warning or any indication on the surface to show its presence, the pony dropped all four legs into a crevasse, and lay suspended over a deep black abyss upon a bridge of snow. Fortunately, she was too frightened to struggle, otherwise both she and the sledges would have disappeared. But luckily she did not move a muscle. Armitage, seeing what had happened, at once came to my assistance, but unfortunately stepped off his ski to give me a hand, and at once dropped in above his hips. Fortunately, he got out while I was endeavouring to hold the pony up. We passed a line round her neck, and managed to extricate her from her

perilous position. She had hardly gone another hundred yards before she dropped both hind legs down a similar chasm. There was nothing whatever on the surface to indicate the treacherous character of the glacier we were travelling upon—not even a slight depression in the snow. When we pitched our camp for the night, I carefully sounded all round the immediate neighbourhood, to endeavour to ascertain the presence of crevasses.

The bad weather still pursued us, and kept us in camp for the next three days. This gave the finishing touch to our poor pony. On the evening of the second day, when in the tent, I heard her struggling to get upon her feet. I went out to render assistance, in which Mr. Armitage shortly afterwards joined me. We tried for an hour to get her upon her legs, but found her too weak to stand. I then knew it was all over with her. We tucked her up as comfortably as we could in her blanket-coat, and gave her the last handful of oats, kept for an emergency. This was the end of her. Next morning I found her quite dead, and frozen hard. We both of us felt very sad about it. The old pony had become a great pet with us, and at the hut we viewed her as quite one of the family. In addition to that, with her died more than half our draught-power.

When the weather had cleared, we set to work to pick out the most necessary articles for our journey, and discarded everything not absolutely essential. Three sledges were left behind, in addition to a quantity of our equipment. We then continued our march, struggling up the steep glacier-slopes; but soon found that we were obliged to go at least three times over the ground to get along at all, and that with considerable labour. I hauled in front of the dogs, and led the way. Armitage urged them on by shouting and yelling, and, whenever there was a check—which occurred every 5 or 10 yards—by hauling and tugging at the sledges to start the team again. We had at this period two canoes, in addition to our tent, other equipment, and food, and with only five dogs it was not easy to get along at all. The mists now became exceedingly dense, so much so that I do not exaggerate when I say that on many occasions we could not see beyond the points of our ski with anything approaching distinctness. The frost-rime was also exceedingly troublesome. It coated our equipments and clothes with ice, and every morning before we broke up camp we had to remove ice 3 to 4 inches in thickness from our belongings. Our furs, too, and clothes got wet from the great fluctuations in temperature. When sitting in our tent with furs on, all this ice turned to water, and as soon as we went outside, our clothes became as stiff as sheets of iron. Occasionally we would get exceedingly clear intervals of an hour or two, and from an altitude of 1450 feet I could see no land whatever off the coast. Gillis Land, I was convinced, does not exist anywhere near the position assigned to it on the charts.

We would march for half a day, or possibly one day; then would come a driving gale and dense snow from the south-east, which would no sooner cease than back the wind would come from the north-west. This would go on for three, or even four, days at a time, when we would start again, and after another similar interval of fine weather the dose would be repeated. On the 19th we endeavoured to reach the sea-ice, being utterly tired of the charming conditions we found at the high altitude of the glacier. I ran down on ski to the head of Nordenskjöld bay, having crossed behind Cape Mary Harmsworth, which we found to be the most westerly point of Franz Josef Land. I, however, found that the sea-ice was in a broken-up condition, so we had to con-

CAPE CROWTHER: CAMP AND BOAT. JULY, 1897.

tinue our march over the top of Cape Lofley, when I again went forward to reconnoitre. We fortunately found a certain amount of fast ice at the head of Weyprecht bay, and that night we camped at the edge of the glacier-face, heartily glad to be off that horrible glacier country. The next two days were occupied in crossing this bay, the ice of which was in an exceedingly tumbled-up condition. We soon found, however, that it was impossible to round Cape Ludlow, owing to the broken-up state of the ice right up to the glacier-face. There was nothing for it but to strike up Weyprecht bay, and take to the glacier again. This we did by hauling our sledges by purchase up the perpendicular glacier-face, aided by a snowdrift. Here again bad weather promptly checked us. For three days we were camped on the top of Cape Ludlow, and here we got the first bear that we had seen since we

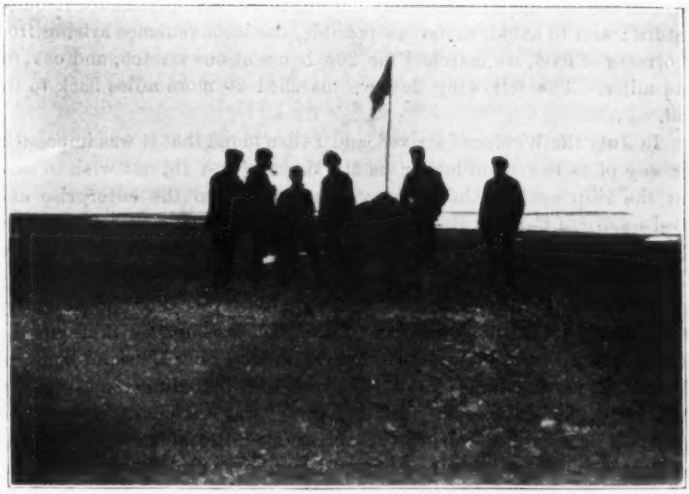
left the hut six weeks before. The blubber came in very handy in a fat-lamp which I made out of a tin for cooking purposes. We were glad of the kill in many respects, for we were uncomfortably short of many things. Our spirit, which we used as fuel, was almost exhausted; and the meat itself was a great addition to our larder. The dogs, too, were all the better for the feast they now enjoyed. We continued our climb up the glacier, and after travelling for a day we were again stopped by a gale of wind which blew to the strength of a whole gale, cutting the snow off the cloth of the tent, and blowing up one side of it, and so filling the tent with snow. We had to put up with this unpleasant condition of things the greater part of one day, as we could not open the tent to go outside and make it fast, lest it should be blown away. As soon as it cleared, I took bearings and photographs of the surrounding country, and then we started off down the glacier on our way for Cape Neale. We got down on to sea-ice after some considerable trouble, and had to go a long way towards the head of Cambridge bay before we could find a low-enough portion of the glacier-face to enable us to reach the floe.

The bad weather had been so exceedingly persistent that I found it was necessary to utilize every fine moment accorded us, and on many occasions we marched for twenty-four hours at a stretch, and on one or two occasions literally from the time one gale ceased until another one began. In Cambridge bay and all round Capes Neale and Crowther, we met with the roughest and most crushed-up ice that I had ever seen anywhere. Taking on single sledges and retracing our steps was the constant order of the day. We left behind one of the canoes in Weyprecht bay, as we found it quite impossible to get along with it, and we had to trust to not requiring it.

Upon Cape Neale, in 1895, we had placed no less than four cairns with records, but we found, on visiting them again, that the bears had broken off all the flags that had flown above them. We left another record, and a "Jack" enclosed in a tin in a cairn on the shore, and then continued our journey. At Cape Crowther we were again detained for three days by bad weather, and then pushed across Gray bay. We again found ourselves cut off by open water on nearing Cape Grant, and it was not until we neared the head of Gray bay that we found even a possible drift to help us up the steep glacier-face of 50 feet. We hauled our sledges up by purchase with great difficulty, and again began our climb up the steep glacier behind Cape Grant. The following day we descended on to the ice at the head of Josephine Peary bay. Open water extended some distance into Nightingale sound. Upon Cape Stephen we stopped for a few minutes for lunch, and after a march of twenty-four hours reached Eira House, which Mr. Smith had erected upon Bell island in 1882. We arrived here at 11 a.m. on June 5. Four hours afterwards we were joined by Dr. Koettlitz and Messrs.

Bruce and Wilton, who, having become uneasy through our being ten days overdue, had started off to meet us with a sledge of provisions. We had succeeded in defining the extent of western Franz Josef Land, mapped in its shores, and had established the non-existence of Gillis land. Mr. Armitage had been most assiduous in taking regular meteorological observations throughout the journey, and had taken astronomical observations of position whenever the conditions were at all suitable. We were away for two months, but only got thirteen and a half tolerably fine days.

After staying for ten days at our hut to refit and break in two puppies and three small bitches for sledging (I was obliged to press



CAIRN ON SPIT OF CAPE MARY HARMSWORTH. AUGUST, 1897.

these very unsuitable animals into the service owing to the dearth of draught-animals), my intentions were to go east as far as Brady island and complete the odds and ends of unmapped coast in that direction. On nearing the high cape at the south-east corner of Hooker island, the ice became exceedingly thin; but, owing to the fact that it was, and had been, snowing heavily all day, the extremely treacherous nature of the ice was not clearly discernible. When within 400 yards of the shore, our sledge broke through the ice from stem to stern. I attempted to step off my ski to get a better purchase in hauling it out, but found that the ice was so thin that it would not bear my weight without them, and when trying to haul in my snowshoes the extra pressure so weighed down the ice that I had to desist. We had brought no canoe or boat,

as we had insufficient draught-power to haul it. Mr. Armitage and I managed to get a few things from the rear of the sledge by cutting open the sledge-bags; but the provisions, being in bags weighing from 50 to 70 lbs. apiece when dry, had now become exceedingly heavy, owing to the water in them. The sledge finally turned over, and all the provisions, with the exception of a handful put out for lunch, went to the bottom, and all our cartridges were soaked with water. I was still reluctant to be defeated at the last moment, and endeavoured, by approaching Hooker island further to the westward, to reach the glacier, and thus ascend Cape Cecil Harmsworth, and map in the surrounding country from there. We soon found, on approaching the shore, that rotten ice intervened and stopped us. Having no provisions, and the road to the east being completely cut off, there was nothing for it but to return; and to avoid, as far as possible, the inconvenience arising from shortness of food, we marched for 25¾ hours at one stretch, and covered 41½ miles. The following day we marched 20 more miles back to the hut.

In July the *Windward* arrived, and I then found that it was impossible for any of us to remain longer, as Mr. Harmsworth did not wish to send out the ship again. On our way home, owing to the enterprise and good nature of Captain Brown, we were able to steam round Cape Mary Harmsworth, where, on the spit beyond the icy portion of the cape, we discovered a large breeding-place of the ivory gull, where literally they were nesting in hundreds upon the ground. We here made many collections of scientific importance, and then steamed 50 miles to the north-west of Cape Mary Harmsworth without seeing a sign of land. I also took photographs of the whole coast-line, including Cape Ludlow, Cape Lofley, and Cape Mary Harmsworth. I was anxious to endorse the opinion I had formed during the spring sledging of 1897 that Gillis Land does not exist, knowing how hard land dies supposed to have been once seen. However, in addition to no land being seen at our furthest point to the north-west, we obtained soundings in 223 fathoms. We then steamed through open water, with no land in sight, towards the easternmost of the Johannessen islands, passing within 10 miles of the supposed coast. We could still see no land; neither is there a chain of islands, as has been supposed in some quarters, reaching from Franz Josef Land to Spitsbergen. This, I think, will set at rest any doubt as to the superiority of Spitsbergen, when compared with Novaya Zemlya, as a line of retreat from Franz Josef Land to civilization.

We continued our voyage to London, passing to the east of Hope island and Bear island. There was exceedingly little ice in the sea, and nothing whatever to stop even the *Windward* passing through. Such an open year I had never before seen.

So far from viewing Franz Josef Land as a favourable route to the pole, my experiences now lead me to believe it to be one of the worst,

and although I have, in common with other arctic explorers, the greatest desire to stand upon that mathematical point, still I have no sympathy with an attempt to reach the pole as a mere athletic feat alone, but consider that geographical and other scientific work should always be included in the plan. Whatever our success may be, I will leave others to judge; but whatever success we have attained is entirely due to the hearty goodwill and devotion to duty of my companions. Mr. Armitage was our astronomical observer, and was also in charge of the meteorological observations. To him, also, is due the magnetic work. A better fellow in every way I could not have met with. Mr. Bruce was our zoologist, a work which, in that part of the world, is frequently carried on under circumstances the reverse of agreeable. It is no pleasant job to dabble in icy-cold water, with the thermometer some degrees below zero, or to plod in the summer through snow, slush, and mud many miles in search of animal life, as I have known Mr. Bruce frequently to do. Mr. Fisher, as you know well, is a most ardent botanist. To him are entirely due the satisfactory results in the botanical section. In many other ways, outside his special department, Mr. Fisher gave evidence of goodwill and energy. Dr. Koettlitz, in addition to being our medical man—to whom we owe the remarkable record of good health—was our geologist. In this, as in every other duty that Dr. Koettlitz had to perform, he was most untiring and conscientious. Mr. Wilton was our master of hounds. In this duty, as in every other, scientific or otherwise, he was most willing and hearty. Hayward undertook the arduous duties of cook at the hut, which office was anything but a sinecure. These gentlemen are present here to-night, and I have asked them each to say a few words with reference to their particular departments,* which I have barely myself touched upon, as I consider that men who do good work should be allowed to speak for themselves and share any honour there is.

I trust you will excuse the sketchy outline of this paper, but it is quite impossible to give, in the short space of an hour and a half, anything like an accurate idea of the journeys extending over a space of more than three years.

Our immunity from scurvy I attribute to the use of fresh meat, and to the care with which all tinned provisions were examined before being used. With proper precautions, I consider that any intelligent body of men may keep in good health in the arctic—at all events, for a certain time. The thing most to be dreaded is the peculiar mental effect that total seclusion from mankind produces. Although we were all as jolly and happy a party as ever went to the arctic, still we were all aware of the effect that the long cutting-off from civilization produces.

I cannot close this paper without referring to the good advice and

* These are printed as an Appendix to the paper.

assistance rendered to the Expedition and myself, from what I may be forgiven for describing as the "Old Guard of the Arctic," who in times past have so gallantly upheld British prestige within the polar area. To Sir Clements Markham, Sir Erasmus Ommanney, Sir Leopold M'Clintock, Admiral Markham, Sir Allen Young, Sir Vesey Hamilton, Mr. Leigh Smith, and many others whom I could mention, but time will not admit, I am indebted for much kindness and help; to Dr. Neale, who was with Mr. Smith on two of his voyages, for valuable assistance he has given me in many ways. I do not intend this as a list of acknowledgments, for I hope to be able to thank many others at no distant date.

The PRESIDENT: It now only remains for us to express our admiration of the way in which this expedition has been conducted, and more especially of the journey that was made by Mr. Jackson and Mr. Armitage in the present year. I think, and I believe that Sir Leopold M'Clintock and Sir George Nares will agree with me, that the journey round the western island of the Franz Josef group is amongst the most important that have been made in recent times. I do not exactly remember the greatest distance that Mr. Jackson walked; I think 41 miles in one day, and 20 in another. I recollect few marches of the kind in other arctic expeditions, although it is true that Jackson had not a very heavy weight to drag with him. I am sure you will carry with acclamation a vote of thanks to all connected with this expedition. I desire first to mention the name of Mr. Harmsworth. In the reign of Queen Elizabeth, when we had such long lists of men who did admirable work for their country, those who stood in the front rank of patriots were the men who sent out the arctic and other expeditions, like Sir Thomas Smith, the first chairman of the East India Co.; like Sanderson; like Sir Dudley Digges; and like Sir Felix Booth, who enabled the Rosses to discover Boothia. Mr. Harmsworth is a worthy successor of these patriotic merchant princes, and to him, first of all, our thanks are due. I must also mention the name of Mr. Montefiore Brice, who did such hard work in equipping and organizing the expedition; but above all our thanks are due to the gallant explorers. I now ask you to pass with acclamation this vote of thanks to Mr. Jackson and his companions, and also to Mr. Jackson himself, for the trouble he has taken in preparing his interesting paper, and showing us the series of views on the screen.

I beg to convey the thanks of the meeting to you, Mr. Jackson, and to your companions, the members of the expedition.

APPENDIX TO MR. JACKSON'S PAPER.

METEOROLOGICAL, MAGNETIC, AND ASTRONOMICAL OBSERVATIONS.

By Lieut. ARMITAGE.

OF course the results of the meteorological and magnetic observations have not yet been worked out by experts in those sciences, and I will confine myself to our practical work. During the whole of our stay in the north, we took four-hourly meteorological observations from 8 a.m. to 8 p.m., with the exception of the first two winters, when we made continuous two-hourly observations, which consisted of barometer, thermometer, and anemometer readings; observations of clouds,

snowfall, the general appearance of the weather, and any phenomena that might occur. For the last year, at Mr. Bruce's suggestion, so long as the sun was above the horizon, he and I made observations of the rainband every day at noon, and generally found it conspicuous by its absence.

The movements of the ice, the opening and closing up of streams of water, their direction, and the extent of open water were also noted in the meteorological record. The prevalent winds were from an easterly direction, generally east by south, and east-south-east.

On only one occasion did we have more than light airs or winds from the south-west at our level at Elmwood, and that was in the summer of 1896, although I have frequently heard the wind from that direction blowing strongly among the cliffs 700 to 900 feet above us. Gales were unpleasantly frequent from every other direction, especially during the late autumn and winter months. On several occasions, after four or eight hours of light south-westerly airs, we would experience a furious blow from the north and north-east, as though the powers that be at the pole were determined that no intruder should invade their dominions. During our sledge journey, in the spring of this year, we experienced gales from the south-west on two occasions, while at Elmwood, some 40 miles south of us, they had calms and light airs.

On comparing some of my observations with those of Dr. Nansen, taken at his winter quarters 80 miles north of us, I found that he had often similar weather to us. We never had such low temperatures as many other expeditions; but with us wind was no respecter of cold, and it was not very uncommon to have a gale when the thermometer showed over 70° of frost. The temperatures were most erratic, and although the mean temperatures were, with one or two exceptions, fairly regular for the same months in different years, we have had differences of 60° in forty-eight hours. Our highest registered temperature was +43° Fahr., the lowest −54° Fahr.

I made a point, during the winter months, of noting down observations of the aurora borealis at the same time as I made my weather observations. From what I had read and heard of the brilliant northern lights, I must confess that, on the whole, I was disappointed by their display at Elmwood. As a general rule, the aurora consisted of faint straw-coloured bands or arches of light, stretching from the east through various altitudes to, or nearly to, the western horizon, often with streamers rising from them towards the zenith. Of course, on some occasions we had exceedingly brilliant displays, with a corona in the zenith, from which long streamers of many hues radiated, circling round the heavens, first in one direction and then in the other, gradually disappearing, and again approaching us, forming into many different fantastic shapes, until the eye was dazzled and the brain bewildered by what the poor Esquimaux may well have thought to be the shades of the departed. The most brilliant auroras occurred during calms or gales of wind. I have often listened intently to distinguish some sound from the aurora, but have never been able to do so, though on a very calm night the movements of the ice, the slightest sound being so audible, would lead one to believe that there was some. I have seen the aurora apparently so close as to be between the cliffs at the back of the house and myself, and have occasionally seen it bright enough to cast a shadow, and to eclipse stars below the third magnitude. On the latter occasions it also appeared very dense. It has also appeared to struggle up against a gale of wind, and be driven back to that point of the horizon from which it ascended, although at other times it has quickly covered the heavens, rising against a furious gale.

I made my magnetic observations in a wooden structure which had been

specially built before our departure from England. It was warmed with lamps before I commenced work in it, for I found that the condensation of my breath on the instruments seriously interfered with the observations. The observations with the dip-circle for inclination were fairly regular and steady; but when observing for the horizontal force and declination, the needle was often most erratic in its motions—so much so, that I have sometimes had to discontinue the observation. This most frequently occurred when there was much display of aurora, and has, on occasion, been succeeded by a violent gale of wind. With regard to my observations for position, I will only say that, in my opinion, a small theodolite is most necessary for travelling in those latitudes, and that all instruments should be specially fitted with a view to keeping the mouth and nose as far away from them as possible.

I cannot speak too warmly about the very enthusiastic assistance, often at inconvenience to themselves, given me by my comrades whenever I required it, and also of the pluck and perseverance of my leader. I wish to express my admiration of the way in which Mr. Leigh-Smith has laid down the positions of those parts of southern Franz Josef Land which he visited. Before I sit down I feel that I must pay homage to the many gallant men who have striven in the polar regions before us; to those of all the nations who have helped to make the world known to us as an open book; and more especially to those heroes of our own country who have made us proud of the name of Briton, and to him with whom we claim a common descent from the Norsemen. I would also give my heartiest thanks to Sir Clements Markham and his colleagues in the Royal Geographical Society, for their great kindness and encouragement to a young and unknown man like myself. It is such encouragement which makes us endeavour, no matter how difficult the circumstances which we may work under, to deserve success.

Brief Sketch of the Geology.

By Dr. Reginald Koettlitz.

When news first reached the world that a new land had been discovered in the arctic regions to the northward of Novaya Zemlya and Spitsbergen, this land was described by its discoverers, Payer and Weyprecht, as being of large if not continental proportions. Julius Payer judged this to be the case for two reasons: firstly, because all the land he could see—and he had extensive views from the heights he ascended to—had every appearance of being, in his judgment, of great size; and, secondly, because of the large size of the icebergs he thought he saw and described, that these bergs could only be shed by glaciers coming off an extensive tract of land. It will be remembered he compared them, both in size and shape, to the antarctic bergs seen and described by voyageurs to the south.

Mr. Leigh Smith was the next to visit this land, and if he does not agree with these conclusions of Payer, he at least does not disagree with them in anything published by or through him.

It is on account of these supposed proportions of this newly discovered land that Payer goes so far as to recommend it as a likely route polewards, for he presumed that the land stretched for an indefinite extent in that direction.

Upon these reports as a foundation, this route towards the pole was also recommended by several arctic authorities, and it was for the same reason that Mr. Jackson planned his expedition to Franz Josef Land. You can, therefore, judge of his dismay when we found, on the first journey northward, that this report of Payer's

had no foundation in fact, and upon that and subsequent sledging expeditions saw that this land was nothing more than a broken-up mass of land forming a group of islands; so that we may say that the discoveries of Dr. Nansen, taken in conjunction with those of our expedition, conclusively prove that this supposed continental land is merely an archipelago of small islands, not extending far north.

Again, in the course of, I think I may say, a continued series of observations, such as no men have ever had the opportunity of making here before, we never, also in the remotest sense, ever saw anything like the large-sized icebergs described by Payer so graphically as being of such great proportions.

We can, therefore, now say that Franz Josef Land is formed of the fragments of an old tableland which was once of fairly large size, and which was no doubt connected with other lands from which it is now separated by considerable tracts covered by the sea.

The earliest geological history of this land, which we learn by what can be read in the rocks, is that, at least in the more southern part, it formed part of the shore of a land which has now disappeared, and that the time when such was the case was the Lower Oxfordian of the Jurassic period, for sandstones and shales containing plant remains, beds of lignite, and other evidences of littoral and estuarine conditions are among the lowest of the beds of stratified rock which I found there. Evidence of oscillations of level now show themselves, for such beds as those described are succeeded by those of purely marine origin, the age of which can be plainly stated, because ammonites so well known and so limited in zone as *Ammonites Macrocephalus* and *A. Modiolaris* were found in them.

I cannot do better than here quote what Messrs. Newton and Teall, who have so ably examined and reported upon the geological specimens I sent home last year, say upon this point, in a paper read before the Geological Society on June 23 last, and to be published shortly in the *Geological Journal*, and that is: "Owing mainly to the brilliant researches of Neumayer, it is now generally recognized that the Jurassic sea reached its greatest extension in the present land areas during the Callovian and Oxfordian periods. Hydrocratic and geocratic movements alternated during Jurassic times, with a decided balance in favour of the former, and a recession of the coast-line towards the north. Even in the north of Scotland we find no decided evidence of the proximity of land during the Oxfordian period, although the lower portions of the Jurassic formation are represented by littoral and estuarine deposits.

"Under these circumstances, the discovery of Macrocephalus beds in Franz Josef Land, in association with plant-bearing strata, is of special interest. It extends the range of this ammonite several degrees towards the north, and shows, in all probability, that during the period of its existence a coast-line lay somewhere in this direction. Marine deposits of Callovian and Oxfordian age are now known to range from Sutherland to Cutch, and from Franz Josef Land to the north of Africa, and *Ammonites Macrocephalus* is one of the most widely distributed of all Jurassic ammonites."

The oscillations of level above mentioned are shown by the extraordinary number of different-coloured thin strata of clay, shale, and sand, which latter is often false-bedded, and frequently has many rounded water-worn pebbles of all kinds embedded among it. Other ammonites, as well as belemnites, pecten, and avicula remains were also interspersed among these marine strata, which were found in places to continue in an unbroken series for quite 500 feet above sea-level.

Now succeeds a rock through which the distinctive character of Franz Josef Land is formed—that is, the plateau or tableland formation, which so strikes the observer, namely the basalt or dolerite, which forms its principal feature, and which largely,

through the rocks *in situ* and the *débris* falling from it, masks and covers over as well as preserves the stratified rock underneath it. Mr. J. J. H. Teall, of the Geological Survey, has made a most exhaustive microscopical and chemical examination of the specimens sent home last year, for details of which I would refer any one interested to the next published number of the *Geological Journal*. I will, however, quote his conclusion, in which he says:—

"It is evident, therefore, that the basalts of Cape Flora and Hooker island are similar to types widely distributed in the Brito-arctic volcanic province. They differ from the more common holocrystalline opitic dolorites in containing a small quantity of interstitial matter. The general result of this examination is to confirm the conclusions of Payer, Etheridge, and others, that Franz Josef Land belongs geologically to an extensive region of plateau-basalts, including such widely separated localities as Jan Mayen, Iceland, Greenland, the Faroe islands, the west of Scotland, and the north of Ireland."

This basaltic rock formation is of considerable thickness, namely, from 500 to 600 feet or more in perpendicular height, and, when viewed carefully, can be seen to be composed of successive tiers to the number of seven or eight or more, between which tiers one can frequently find thin layers, or strata, of clay, sand, and sandstone, generally from 1, 2, to 4 feet in thickness, similar in every respect to those one finds underneath. In one of these strata, between the second and third tier of basalt, and quite 100 or more feet above the lower edge of the basalt formation where it is in contact with the main stratified rocks below, I found more of the plant fossils which Dr. Nansen speaks about in his book as having been found on a nunatak protruding from the glacier to the north-west of Elmwood, and which he sent to Dr. Nathorst, who considers them of Upper Jurassic age. This stratum was a continuation of the bed on the nunatak, which I had also found and shown Dr. Nansen, and I afterwards found and traced it for several hundred yards on about the same level as the nunatak bed, and quite a mile away, proving to my judgment conclusively that the bed on the nunatak, which Dr. Nansen and I were doubtful as to whether it had been moved from its bed by the lava-flow, had not been, but was *in situ*, and was part of this stratum, which was 2 feet in depth, and undisturbed. This fact, together with other considerations, which I will detail shortly, have an important bearing upon the probable age of these basaltic lava-flows, and also upon the question as to whether they are intrusive sills or not. Mr. Teall, I know, leans to the opinion that the basalt of Franz Josef Land is of Tertiary date, in the same way as similar formations in Scotland, Ireland, and other places, and that the apparent interstratification is due to intrusive sills. I must say, however, after considering the points he has raised, that the balance of evidence is unquestionably in favour of Jurassic date. My reasons briefly are: (1) that the strata which I saw between the tiers of basaltic rocks are so thin and level, and show so little evidence of displacement by lava having been intruded between them; (2) we cannot see that heat has materially altered these strata; (3) upon or among the middle tiers of basalt I have found fair-sized and intact branches of wood, which have undoubtedly been charred into charcoal, which is almost as light as though recently burnt, and which must have been growing in the sedimentary rock, among which I found it, upon the upper surface of the first or lowest tier of basalt, and been charred by being overwhelmed in a surface-flowing mass of lava; and (4) because, unlike what is usually found among intrusive sills, this basalt is vesicular or amygdaloidal on the upper and lower borders of a tier, at which position it is generally more compact in intrusive sills, and thus agrees more with the conditions of a surface-flow.

It is upon these grounds that I base my belief in thinking the date of some, at least, of these basalt-flows to have been in Jurassic times.

If the above is correct, then there is no evidence of any rock *in situ* being of later times, and therefore any strata that may have been laid down after this has disappeared through denudation, or is lying under the perpetual ice-sheet that covers these islands.

At this time, therefore, if I am correct, this land was above sea-level; trees and plants were growing upon it; the climate was very different to what it is now, for verdure, and that luxuriant, clothed the surface, much of which was also woody. In fact, we can see that, judging by the species and genera of plants which have been recognized, the climate was a cool, mild, and genial one. It was at the same time connected, in all probability, with other lands—most likely, judging by the similarity of the basalts, with Spitsbergen, Scotland, Ireland, the Faroe islands, Iceland, Jan Mayen, and Greenland. There is also evidence, it appears to me, judging by the fossils found—both plant and animal—of the land having been once or more connected with Northern Europe and Siberia.

The results, which may be obtained when the examination of the specimens which I brought home this year is completed, I cannot of course give you at present, but what I have here given you are in brief a few of the facts which, up to the present, we are in possession of.

Flora of Franz Josef Archipelago.

By Harry Fisher.

In the *Geographical Journal* for December, 1896, pp. 560–563, I made some remarks on the above. Since the publication of that account I have had opportunities of studying this flora, and of comparing the results with those of almost every other known arctic region. A full account will shortly be presented to the Linnean Society. Mr. Armitage has told you that south-westerly winds are almost unknown in Franz Josef Land. I believe this will account, to some extent, for the flora being more scanty and stunted on the whole than that of almost all the other arctic regions. The summer temperatures are lower than elsewhere. There is no doubt that the presence of the Gulf Stream on the west and north-west coasts of Spitsbergen will account for the luxuriance of the flora up to Brandewjne bay, whereas the east coast of North-East Land resembles Franz Josef Land. The Gulf Stream, however, will not account for the comparative richness of the flora of Melville island, of Grinnell Land, and of Port Foulke, the last named being on the Greenland side of Smith sound; these are separated by channels of inconsiderable width from the mainland. To the north of Port Foulke is the great Humboldt glacier, which has been considered to form a barrier* to the northward progress of the flora on the west side of Greenland. We know next to nothing of the plant-life on the lands to the north of Peary channel; but I expect an extension of the Grinnell Land flora will be found there, and probably an arctic Siberian type also. The most northern land in Asia, Cape Chelyuskin, has a smaller flora even than Franz Josef Archipelago (and most of the plants are as dwarf), notwithstanding that it is on the mainland of a vast continent. This can only be accounted for by supposing it to have been submerged until comparatively recent times; but the flora of arctic Siberia is generally poor in species.

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* See Sir J. D. Hooker's 'Outlines on Distribution,' etc.

There is one zoological fact of interest to the botanist. Young snowy owls visit Franz Josef Archipelago every summer; two of these handsome birds were killed on Cape Flora, and I found pellets and feathers of this species on all the capes which we visited. Several birds were seen, besides the two which we killed. Does not their presence indicate the existence of the lemming, and therefore the willow, in recent times?

It is difficult to understand why some of the plants maintain an existence under such unfavourable conditions as the present, unless they are, as they appear to be, dying-out remnants of a typical arctic flora. I am thinking of the starved colony of *Gruphephorum Fisheri* Asa Gray (a grass), composed of about twenty lifeless-looking individuals on Mabel island, and not seen elsewhere; and also of *Stellaria longipes* and Goldie, which presents a similarly lifeless appearance. Of this two flowers only were seen; they were on Cape Neale. Even flower-buds were not found elsewhere. The bald-leaved *Cerastium* makes no attempt at flowering. A few other plants merely exist. Unless the conditions improve, most of these plants will disappear; not, as in warmer climes, to be replaced by others, I fear, there being already abundance of spare ground untenanted by any plant. It is very remarkable that I should have found seedlings of the poppy (*P. nudicaule* L.), the scurvy grass (*Cochlearia fenestrata* Br.), and *Draba leptopetala* Fr. This was quite unexpected, for I know of nothing of the kind from similar latitudes. The anthers and stigmas of the poppy, so far as I had time for observation, were ripe at the same time. There are no insects which are likely to have assisted in fertilization in this case; but, as regards the scurvy grass, my observations lead me to the conclusion that diptera may occasionally assist, but at the same time they are more certainly foes than friends, inasmuch as their larvæ feed ravenously on the floral organs of this species. Seedlings of the scurvy grass were found on Gully rocks and on Cape Flora, sparingly. Those of the poppy were seen in one place on the latter cape. Seedlings of the *Draba* were found on Cape Flora, but in such limited quantity that they only occupied half a square inch. I look upon this last rather as an accidental result. The case of the poppy is a little stronger, and *Cochlearia* (scurvy grass) probably increases to some extent by seed in most summers. All attempts at solving the problem of the derivation of this flora are purely theoretical. The depth of the sea between Novaya Zemlia, Spitsbergen, and Franz Josef Archipelago only throws a little light on the subject. Geology and ocean currents render little service; possibly the working out of the driftwoods may throw some light on this obscure subject.

A large number of specimens of driftwoods were collected, and have been entrusted to Prof. Carr, M.A., F.G.S., F.L.S., of the University College, Nottingham, for examination. Of all of these numerous microscopical sections have been made, which will be compared with similar sections of known woods from Siberia, arctic Europe, and North America (prepared from specimens kindly supplied by the director of Kew gardens, supplemented by some in the Fisher collection in Nottingham Natural History Museum from the Russian Empire, all of which are authenticated by Dr. Regel and Herder). These driftwoods are mainly coniferous, but a few are non-coniferous, and it is hoped that the exhaustive examination to which they will be subjected will prove their identity and probable place of origin. The labour of collecting and sledging these woods, many of which were huge trunks, was borne by Messrs. Jackson and Armitage and Dr. Koettlitz; some few were collected by Mr. Child and myself, my own task being a light one, consisting of cutting suitable pieces for examination and for specimens, etc., chiefly from the heaps which three of us made on Capes Gertrude and Flora. On Cape Mary Harmsworth Dr. Koettlitz collected woods, and Mr. E. Else brought a fine piece

also. These are now in Prof. Carr's hands. A fine section was made on ("Tween") Cook's rocks by Mr. Child; this is with the others.

There are certain plants in Franz Josef Archipelago which give a colour to the landscape, occurring as they do in patches or carpets up to an altitude of 500 feet. The poppy is the most showy, but several mosses rival this flower in brilliancy. I have previously mentioned in this *Journal* the bright colour of these plants, but I did not specify them. There are four species which I ought to particularize: *Splachnum Wormskiöldii* Hornem., brilliant green; *Aulacomnium turgidum* Schwgr., pale yellow-green; *Bryum obtusifolium* Lindb., red to crimson and purple; *Orthothecium chryseum* Lorenz, golden yellow. It is interesting to find that these mosses flourish in the neighbourhood of loomeries, and that in their absence they become quite scarce. This is particularly the case as regards *Splachnum*. "The Splachnum family are remarkable amongst mosses for the preference they exhibit for growing in bogs, on the droppings of animals such as sheep, cattle, or foxes, sometimes occurring also on the bones of dead animals."

I have submitted these characteristic mosses mentioned above to Mr. E. M. Holmes, the curator of the Pharmaceutical Society's Museum, who is well known as an accurate bryologist, and I am indebted to him for the names cited above. I have previously mentioned the lichens which give a colour to the rocks, boulders, etc.

May I here express my admiration of the botanical work of Englishmen in the polar American islands?—notably, Captain Sabine and his companions of the Parry Expedition in Melville island, Dr. Richardson, the naturalists of Nares' Expedition, and also Sutherland, Taylor, Markham, Scoresby, Walker, and others; and in the arctic regions of the eastern hemisphere one cannot fail to appreciate the grand work of the Scandinavian and Russian botanists. Such names as Fries, Cleve, Malmgren, Kiellman, and others will always stand as authorities on arctic plants.

Dr. Nansen's botanical work on the ice-floes in the farthest north yet reached by man is not yet published, but I have had the pleasure of seeing his beautiful drawings of a most interesting microscopical flora. I look forward with deep interest to the publication of his scientific work. Dr. (now Sir Joseph) Hooker's work in, and writings on, the antarctic flora are a boon to the future student in that region. I trust the time is near when we shall have an appendix to the unique and renowned 'Flora Antarctica' of our illustrious botanist.

The Zoology of the Expedition.

By W. S. Bruce.

The zoological collection promises to be very interesting, but at present it is difficult to say much, since the preliminary work of assorting is not yet complete, and that of identification not more than begun. Any list, therefore, is merely provisional. The collection chiefly consists of smaller vertebrate and invertebrate forms. Richest of all will perhaps be the micro-organisms, upon which a considerable time was spent all through the winter months, many specimens having been drawn from living or freshly mounted preparations.

Among Protozoa, the Infusoria are well represented. There are sponges and cœlenterates, the latter including hydrozoa, scyphozoa, and ctenophora. Worms are rich in the number of species, and include sipunculids, rotifers, polyzoa, leeches, chætopods, nematodes, etc. Sea-urchins and brittle stars were very plentiful, and the collection also includes several starfish, sea-cucumbers, and feather stars. The sea-cucumbers were mostly obtained from the stomachs of walruses, in which were also found the interesting worm known as *Priapulus*, and various molluscs. Crustacea were

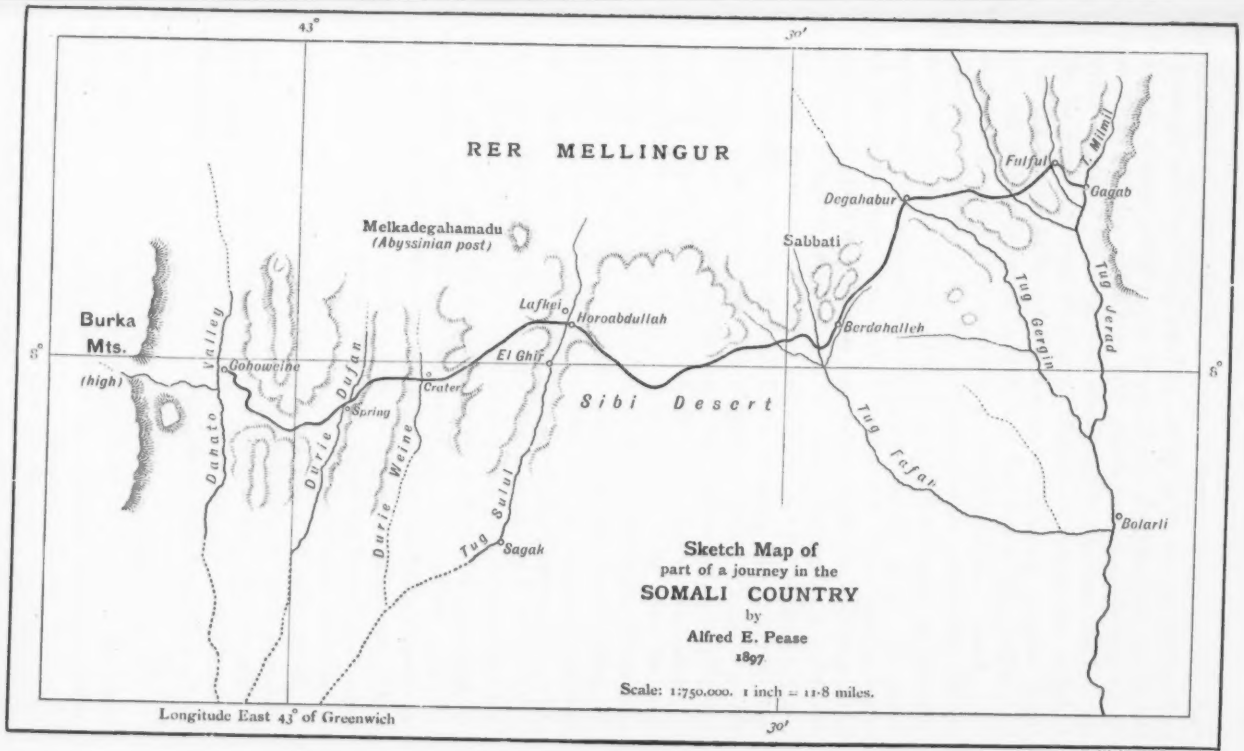
obtained in large numbers; insects are but poorly represented. There are no moths or butterflies. Five or six species of acarina and spiders were obtained; sea-spiders, or pycnogonida, are well represented. To this invertebrate list has to be added a considerable number of bivalves and gasteropods. Among vertebrates, sea-squirts, appendicularia, and probably four or five species of fish complete the series, apart from birds and mammals. Of birds, it may be stated there are at least three new species for Franz Josef Land. It is interesting to note that the only land mammalia are the bear and the fox.

The collection was mostly marine, and was obtained from all depths down to 234 fathoms; the greater proportion, however, consists of animals obtained near the shore at depths varying down to 18 and 26 fathoms. The interesting discovery of bones of walrus, cetaceans, and deer on the gigantic raised beaches will be dealt with by the geologist.

A VOLCANIC CRATER IN NORTHERN SOMALILAND.

By ALFRED E. PEASE, M.P.

On February 5, 1897, after leaving Horoabdullah, we ascended the hills to the west of the Tug Sulul. These hills are very rocky, sometimes jagged rocks, occasionally on the tops large bare slabs or tables of rock, and for the most part covered or sprinkled with loose stones—the rock for the most part of a light yellowish to reddish buff, here and there in watercourses of a deep grey. For about four hours after reaching the summit, we passed over a plateau, covered like the rest of the hills with scrub and the usual Somali vegetation (still rocky and stony). Then we descended, still travelling west, a ravine steep and rocky, which led us down to a narrow valley, perhaps a mile in width at this point. On leaving the eastern rocky hills, we continued nearly half a mile down a very gentle plain to a river-bed, which was walled in with basaltic-looking rocks, which were very black or dark red-brown, and which in places went down in steps of about 6 to 10 feet; the river-bed was paved with the same rocks in slabs and steps. The ground between the hills we had just left and the river-bed was very peculiar, the soil being light and of a different consistency to any we had passed over or met with subsequently; it was of a similar red tint to the ordinary soil, but dirtier and very heavy walking, and my wife complained of it and remarked on it. On this (the east) side of the river-bed, up to the crater from the river-bed, the bush was especially luxuriant, and several shrubs we seldom met with were common. The dirty light soil from A to the crater was practically devoid of vegetation; such as there was had a poor and sickly appearance. We returned on our tracks about 300 yards into the bush, and whilst hunting for a good shade for "tiffin camp" and awaiting our caravan, we discovered an old crater shut in and overhung on one side by the bush. It is very distinct. The mouth is to the eye perfectly circular, the diameter of the mouth not more than 100 feet, and the depth about 35 or 45 feet; it was formed, as far


43°
30'
RER MELLINGUR
Melkadegahamadu
(Abyssinian post)
Sabbati
Degahabur
Fulful
T. Milmil
Gagab
Burka
Mts.
(high)
Danato Valley
Gohoweine
Durie Dujan
Spring
Crater
Lafkei
Horoabdullah
El Ghir
Berdahalleh
Tug Gergin
Tug Jerad
Sibi Desert
Durie Weine
Tug Sulal
Sagak
Tug Tafar
Bolarli
5°
Sketch Map of
part of a journey in the
SOMALI COUNTRY
by
Alfred E. Pease
1897
Scale: 1:750.000. 1 inch = 11·8 miles.
Longitude East 43° of Greenwich
30'
Walker & Boutall sc.

than 100 feet, and the depth about 35 or 45 feet; it was formed, as far as I can tell, of lava. The lip was, perhaps, from 1 to 3 feet higher than the surrounding ground, which sloped gently down towards the river on the west side, and was almost level or rose very slightly on the east side. There were one or two shrubs growing in the "crater." Having looked at the crater, we thought little more about volcanoes till after lunch, when we resumed our march, and remarked on the patches of lava, which grew larger and more distinct as we approached the river-bed. Across the river-bed the country resumed its ordinary aspect, and the hills rose almost immediately from the bed of the stream. Crossing this narrow ridge, we bent left-handed in our descent, and entered a much wider valley with a large tug, which we marched up till we reached some curiously white chalk-like cliffs and earth, where we found, close to the banks of the tug, a native well about 25 feet deep, into which I descended down notched poles. It is a perennial spring of very clear (for Somaliland) but very sulphurous water. The water was very cold, and I drank it with pleasure; but I think Mrs. Pease and Sir E. Loder did not want a second mouthful. Beyond this, we never met with anything at all resembling these white cliffs or sulphurous springs.

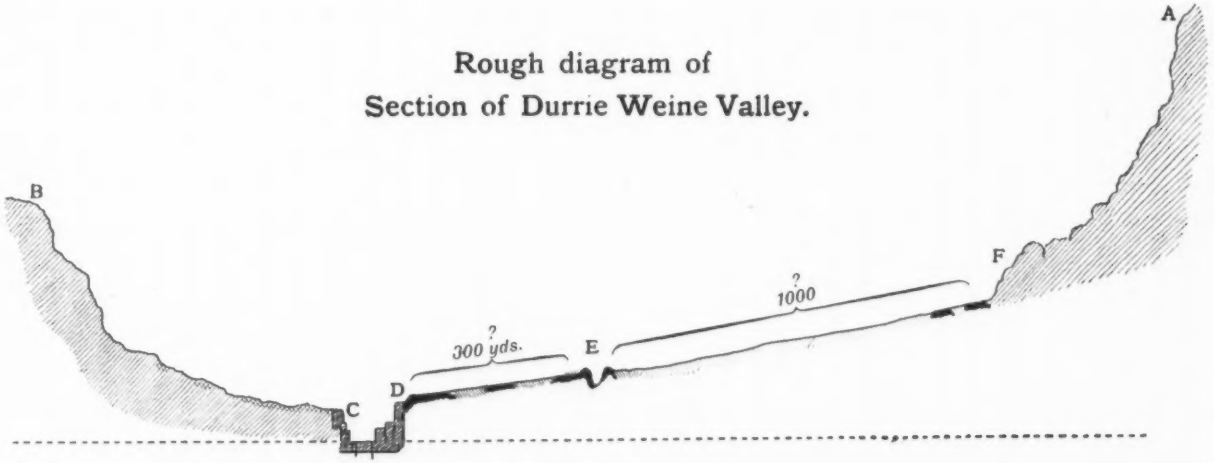
It may seem strange that both in going and returning about a week later, we never made any careful investigation of the neighbourhood, nor kept any specimens of lava or rocks, nor even took a photograph of the crater; but it must be understood that none of us had any acquaintance with geology, that the weather was excessively hot, and none but absolutely necessary exertion is easily undertaken in the greatest heat of the hottest of Somali days. We were marching into a strange country, and our thoughts more intent on our point of destination, and our eyes in examining the tracks of zebras and other animals. Besides, we had had some exciting days at Horoabdullah, for which the Abyssinians were responsible, and, owing to news that reached us in the Dahato valley, we marched hard and fast back over this ground with few other ideas than that of placing as great a distance as possible between the Habasha and ourselves.

Our marches from Horoabdullah were—Horoabdullah to the crater, 5¼ hours; crater to sulphurous spring, 1½ hour.

The names given to these two valleys are suggestive: (1) Durie-weine (*durie* = dirt, and *weine* = big), crater valley; (2) Durie-dûfân (*durie* = dirt, and *dûfân* = the grease or food left round the mouth after eating).

I do not think that there was any sign whatever of a volcano or crater on A (or B). If there had been a crater on A, there would have been, I presume, lava beds and streams on the side of the hill, whereas these hills were the usual scrub-covered rocks. I noticed nothing out of the ordinary course till the foot of A was reached, when we came into the peculiar soil I have already mentioned. Had there been a lava

Rough diagram of
Section of Durrie Weine Valley.



A to F. *Western Scarp of Rocky Hills.*
F to E. *Dirty powdery soil with scant bush.*
E. *"Crater."*
E to D. *Covered with thick luxuriant bush and high trees, with bare patches of lava bed showing through soil, larger and more distinct at* **D**
C. *Black and red-brown rocks walling and flooring river bed.*
C. to B. *Eastern Scarp of ridge same nature as* **A-F** *covered with Scrub.*

up the side of A, I think the suggestion that the crater was a "secondary" one, or blow-hole, would have some probability, as it is a curiously small one. There is, however, the possibility that the lava bed came down the valley, and that a larger or real crater exists up the valley to the north.

HANDBOOK OF CLIMATOLOGY.

THE *Handbuch der Klimatologie*, published in Ratzel's Geographical Series in 1883, has been the standard work of reference on the subject since its publication. The enormous extension of the system of meteorological observations in all parts of the world, civilized and otherwise, during the last few years, as well as the very considerable advances made in our general knowledge of the conditions controlling and determining climate, have been sufficient to make any work of so long standing distinctly out of date. The period has, however, brought forth no meteorologist whose learning and critical skill can compare with those of Dr. Julius Hann, and it is therefore a matter of congratulation that Dr. Hann has been able to occupy the first months of retirement from active official life in completing a re-issue of his great treatise.

Although the general plan of the work remains sufficiently the same to justify the title "second edition," the framework has been enlarged and strengthened, so as to bear the additional weight laid upon it, and each part of the book has been practically re-written and developed to such an extent, that what was formerly a section is now a separate volume. Hence we have now vol. i. devoted to the general principles of climatology—the normal climate produced by the sun supposed to act on a uniform surface; the modifications introduced by the distribution of land and sea; the climate of elevated regions; mountain winds, and the secular variations of climate. Vol. ii. is entirely occupied by accounts of special climatic regions in the tropics, and vol. iii. deals similarly with the temperate zones and the arctic regions. In every part we find an enormous increase in the amount of material dealt with, and the increasing vigilance in noting every small contribution to the subject, published in no matter how obscure a journal, has covered the ground as easily as before, an achievement which might surprise any one not familiar with the pages of the *Meteorologische Zeitschrift*, whose bibliographical work is always as near perfection as seems possible.

It is impossible, within the narrow limits of space, to give anything like a detailed comparison of the two editions of this book, although a more instructive study in not only meteorology, but geographical history could scarcely be found. Great progress is shown in the exact measurements of solar radiation, which must form the ultimate basis of all meteorological inquiry, and of the thermal constants concerned in different parts of the Earth's surface; and still greater progress in the general

application of these exact measurements to the endless complexity introduced by geographical conditions. It may be permissible to associate these advances chiefly with the names of Langley, von Bezold, Zenker, and of Dr. Hann himself. Another important step is the recognition of the true position of oceanic currents as climatic factors: the drift current, constantly reacting directly on the atmospheric conditions which produced it, is recognized as a vastly more important element than the current produced by forces acting outside the region it traverses. The credit of placing these elements in their proper relations is chiefly due to Pettersson, although the results followed, in a sense, from the work of Zenker.

In the two volumes of descriptive climatology, it is noticeable that British workers take a much more prominent position than elsewhere; we have nothing to be ashamed of so far as the making of meteorological observations are concerned. Our Indian meteorological service remains unique of its kind; nearly all our colonies show good progress in the establishment of observing-stations; while in regions of tropical Africa absolutely unexplored in 1883, the British Association Committee renders a good account of itself.

THE HYDROGRAPHIC EXPLORATION OF LAKE BAIKAL.

In the summer of 1896, a special expedition, under Th. K. Drizhenko, in connection with the Siberian railway, was sent out to explore Lake Baikal, and the report of the explorations is now published in the *Izvestia* of the Russian Geographical Society (1897, vol. ii.). The expedition had at its disposal the steamer *Innokentiy*, and was provided with a Danish deep-sea sounding apparatus (1200 metres of wire), astronomical, magnetical, and meteorological instruments. Unhappily, the deep-sea apparatus was lost, with most of its wire, when the first sounding was taken, and another apparatus, with only 622 fathoms of wire, had to be improvised.

The expedition went all round the shores of the lake, verifying as far as possible the old maps, and making several new determinations of latitudes and longitudes, as well as magnetic observations. The surface temperature of the water was measured, and soundings were taken, each 7 to 15 miles, for a few miles off the coast. Deep-sea soundings were taken across the lake along seven different lines—those which were made in the northern part of the lake being especially interesting, as the southern part had been explored years ago by the Polish exiles, Dr. Dybowski and M. Godlevski.

With all these data, old and new, M. Drizhenko has compiled a preliminary navigation map of Lake Baikal, on the scale of 6·7 miles to an inch, and a reduced copy of it (20 miles to the inch) is published in the

Izvestia. It offers a considerable interest, as it gives the positions of the 100-fathom and the 300-fathom lines all round the shores of the lake. That the south-western part of Lake Baikal is very deep, was already known from the soundings (on the ice) of Dybowski and Godlevski, who found depths down to 747 fathoms. The engineer Bogoslovskiy found, later on, a maximum depth of 791 fathoms (*i.e.* at least 3200 feet below the sea-level). It was believed, however, that in its northern half Lake Baikal must be much more shallow; but it now appears, from M. Drizhenko's soundings, that even between Olkhon island and Svyatoi Nos peninsula, where the lake is very much narrowed by the mountains, depths greater than 622 fathoms were found, and even at its north-eastern extremity the bottom of the lake lies at a depth of 476 fathoms, *i.e.* at least 1360 feet below the level of the sea. Taking into account all the shallow parts of the lake along its shores and opposite the deltas of the Selenga and the Angara, it appears that on only eight per cent. of its area it has a depth of less than 30 fathoms. With the exception of the deltas and the small Ushkanii islands (near Svyatoi Nos), the 100-fathom line runs as a rule very near to the shore, especially along the north-western coast.

The measurements of magnetic declination gave results which speak highly in favour of General Tillo's *Tables fondamentales du magnétisme terrestre*. The measured declinations differed by only $1\frac{1}{4}°$ to 2° from the theoretical ones.

The measurements of temperature of water show that, while at the mouths of the big rivers the surface temperature (in summer) reached from 48° to 56° Fahr., and even attained 67° in one bay, it varied only from 38·1° to 38·6° in the open parts of the lake, and remained unaltered down to a depth of 500 fathoms. It may be said that the superficial layer of water, which has a temperature above 39°, attains in the best cases a thickness of 30 fathoms only (at the mouths of the rivers and near the shores), the whole mass of the water of the lake having a temperature of from 38° to 39·2°, even during the hottest months of the year.

Owing to the sudden changes of wind, to the fogs (in 1896 fog covered all the lake from July 13 to August 1), and to the want of protected bays (of which only four are known), navigation on Lake Baikal is combined with considerable difficulties, especially for sailing-boats. At the present time the lake is navigated by ten steamers, which run thrice a week across the lake from Listvenichnoye (head of the Angara) to Posolskoye (Selenga), and five times every summer carry the post from Listvenichnoye to the upper extremity of the lake.

So long as the railway is not made along the southern shore of the lake, it is intended to carry over the trains (25 carriages) by means of an ice-breaker, which will run from Listvenichnoye to Mysovaya. This ice-breaker, which reminds one by its shape of Nansen's *Fram*, is intended

to break ice one metre (3·3 feet) thick, and is provided, therefore, with an iron armature 9 feet wide. Its length is 290 feet, its width 57 feet, and its tonnage is 4200 tons. Its engines, 3750 horse-power, working on three screws, are calculated so as to give a speed of 13 knots. The *Engineer* describes the ice-breaker, which is being built in London, as a quite unique enterprise in the history of ice-breakers.*

A second hydrographic expedition, consisting of ten officers of the navy, was at work last summer as well, for continuing the exploration of the great lake.

THE CLASSIFICATION OF GEOGRAPHY.†

By HUGH ROBERT MILL, D.Sc.

THE definition of geography has been attempted times without number by people approaching the subject from the most diverse standpoints, and possessed in widely different degree of practical knowledge regarding the aims and content of the science. It will probably not be seriously disputed that different definitions may be employed for different purposes, provided that they are not in actual contradiction, and perhaps the oldest and simplest definition—The Description of the Earth's Surface—remains the most useful. Those who limit this definition to a description of the natural and artificial divisions of the Earth's surface deal only with that part of geography which has been specifically termed Chorography or Topography. This concerns itself merely with detailed description, while the other part of geography has to take account of general conditions. At the outset a distinction must be made in studying or in teaching geography between the General and the Special.

The General in geography deals with the aspects in which the Earth's surface may be considered; the Special has to do with the divisions, natural and artificial, into which the Earth's surface is cut up, each of which may be considered in any or in all of the general aspects.

In any classification made for purposes of systematizing geographical knowledge or for recording geographical literature, there must thus be two separate categories; one for general aspects, the other for terrestrial divisions. Most facts would require to be entered in one only of these categories, but a certain number would have to appear in both. There are certain general rules which hold good for every kind of classification. Of these, the first is to have units of division of approximately equal value, each of which may be subdivided, and each subdivision, if necessary, still farther analyzed. The process may go on to any extent, but it is absolutely imperative that divisions of the first, second, and third order be distinctly separated. For purposes of ready reference to subdivisions, a system of symbols is convenient, which will designate by a few signs the place each subject occupies in the classification. These symbols should be so selected that by means of them subjects can be arranged in their proper order by any one who can recognize figures or letters, though perfectly ignorant, it may be, of either the subject classified or the language used.

At the risk of being tedious, I must dwell upon the fundamental condition of

* The ice-breaker *Nadezhnyi*, which has been built at Copenhagen for Vladivostok, is only 180 feet long, 42 feet in beam, 1500 tons; engines, 2500 horse-power; maximum speed, 11 knots; cost, £43,600. It gave excellent results in the Baltic sea. It cut ice, 25 inches thick, at a speed of 3½ to 4 knots. It made its way for a mile in ice 7 feet thick; but it was stopped by ice which had a thickness of 15 feet.

† Paper read to Section E (Geography) of the British Association at Toronto, 1897.

the subordination of the orders of subdivision. This is recognized instinctively in a genealogical tree, where PARENTS, CHILDREN, grandchildren, *great-grandchildren* represent four orders. Confusion would result if the individuals of all or of any two of these orders were arranged alphabetically or even chronologically. It may not, at first sight, appear that geography is susceptible of division into orders of fact or of territory comparable in distinctness to human generations; but experience in the classification of titles of geographical papers soon teaches that it is so. But while the several orders must be kept distinct, it is sometimes convenient to associate two or more together for temporary purposes, and in the choice of units the possibility of aggregation, as well as of subdivision, should be kept in view.

While all that has been said applies equally to a classification for registering work done, or for directing future investigations, the former is the more practically important object. I have approached the subject from the experimental point of view, and my experience has been obtained in preparing the Subject-Catalogue of the Royal Geographical Society's library. While the subject-headings (which, when complete, will considerably exceed 100,000) were being collected, I commenced in 1892 to classify the notices of additions to the library which appeared monthly in the Society's publication. At first it was only necessary to employ divisions corresponding to the first order for arranging the cards on which the respective titles were pasted. When one of the first divisions contained about fifty cards, they were subdivided into groups of the second order; and in those cases where the cards in any group exceeded fifty, they were subdivided again into sub-groups of the third order. It has not yet been necessary to go further. By this method the bewilderment produced by trying to grasp the multiplicity of detail in a complete theoretical scheme was avoided, only so many subdivisions were in use at any time as were absolutely required; and the need of further analysis was felt before the step was taken. By the time the whole mass of titles for the subject-catalogue is complete, the experimental section will serve as a skeleton classification tested by continual use, for, comprising as it does the additions for the latest years, it is naturally the part most frequently referred to.

After building up the scheme of a practical subdivision, I have been able to compare it with the very comprehensive schemes elaborated by the editors of the *Annales de Géographie* for their annual selected bibliography, and with Herr Baschin's *Bibliotheca Geographica*, the exhaustive annual bibliography published by the Berlin Geographical Society. These have suggested certain modifications and improvements, and the combined result is presented in this paper. That this result is final I do not claim, for if it is to live it must continue to improve; but, however imperfect, it has been evolved by practical work, it represents what appear to be the natural lines of cleavage in the existing literature of the subject, and even in those parts where it is confessedly weak in theory it has stood the test of practice.

In my work at the Royal Geographical Society, I am only beginning to feel the need of a system of symbolic notation; but in view of the ultimate necessity for adopting such a system, it has been carefully considered. The most convenient system would be such a combination of letters or figures as would suggest the subject to the mind without reference to a table. But at the best this could only be used for divisions of the first or second order, and if a table must be referred to for groups of the third order it may as well be made complete. An arbitrary arrangement of letters and figures is much more likely to be useful to geographical workers in general than a mnemonic system. The contractions or letters indicative of places, say in Africa, differs greatly in different languages. Where we find *fwa*, *gea*, es perfectly convenient for French West Africa, German East Africa, Congo State, the official names of Afrique occidentale française, Deutsch Ost-Afrika, and

Etat Independant du Congo, do not fit them at all, and we should be worse off with *aof*, *doa*, *eic* than with a single arbitrary letter. As a practical worker, I feel the superiority of a simple consistent arbitrary notation of perfect flexibility, over one which can only plead the help of a mnemonic in one language as a reason for clumsy symbols which are difficult to combine or to arrange. In order that the work already done may not be thrown away, if it should be desirable to combine it with the bibliography of other sciences in such a work as the Subject-Catalogue of Scientific Literature on which the Royal Society is now engaged, the symbols suggested are put forward here in a purely tentative manner.

Looking at the question of a symbolic classification from the practical point of view of convenience to the cataloguer, printer, and proof-reader (*i.e.* as elements of accuracy in the printed reference), and to the student consulting the record, it seems to me desirable to indicate each selected science by a rational symbol which shall suggest the name, but at the same time to select a symbol of *one letter only* in order to avoid cumbrousness and minimize the risk of mistakes. For example, instead of Gr and Ge for Geography and Geology, **G** and Γ might be adopted.

Assuming **G** as the general symbol for Geography, taken by itself it would be used alone to indicate a discussion on geography in general; qualified by the index for mathematics, meteorology, magnetism, geology, botany, zoology, or anthropology, it would indicate a general discussion of any one of the branches of physical geography; while additional indices could be used in a geographical bibliography to include aspects of the subject, such as historical and political geography, which might justly be excluded from consideration in a catalogue of physical sciences. I should suggest, however, the use of one or two general indices, such as one for bibliography, and one for biography, as it would be exceedingly useful to have lists of publications dealing with these matters under the heads of the various sciences.

If it were only sufficient to indicate localities as one does in a map index, the Earth's surface could be most conveniently divided into eighteen zones of 10° in latitude, labelled A to R, and twenty-four gores of 15° in longitude, labelled *a* to *z*; each of the 432 areas, designated by such letters as A*a* to R*z*, being subdivided into 150 "degree-squares," *e.g.* A*a*1, R*z*150, such as form the units for the laying out of townships in Canada and the United States. This mathematical system, although very attractive in its simplicity, would fit in neither with the conventional limits of countries, nor the natural limits of regions to which almost all distributional discussions are adapted, and therefore it need not be farther considered. The "degree-square" unit has indeed been adopted in a new index of fixed positions in the United States as a subdivision of each individual state; it is generally used in plotting oceanographical data, and occasionally for meteorological results; but it is only appropriate for such purposes.

With regard to the symbols for topographical geography, I would suggest that each division of the first order (*i.e.* continents and oceans) should be indicated by a capital letter, and each subdivision of the second order by a small letter added to the appropriate capital. Thus two letters, *e.g.* A*a*, would indicate every one of the two hundred (or thereabouts) divisions of the second order (*i.e.* countries or regions). Divisions of the third order (states, provinces, etc.) would be shown by an added numeral; so that each complete reference, *e.g.* A*a*20, would show the continent and country, as well as the province indicated.

If a symbolic notation such as is suggested here were adopted in a catalogue referring to all sciences, it would be convenient if a special type could be set apart for geography; the letters might be either ordinary roman Aa, italic *Aa*, or gothic 𝔄𝔞. A strong claim which can be put forward for this is that every science is directly concerned with distributions, and that the formulæ for places would probably be

more generally used than any others in combination with those of various sciences. It would obviously be of vast convenience if a symbolic notation could be agreed upon as applicable to all languages, and to other purposes than purely geographical bibliography.

In considering General Geography, a difference arises between the classification of a geographical library and that of geographical literature in a scheme which admits of all the sciences occupying their appropriate place. In the former case, room must be found for references to many of the sources of geographical facts in astronomy, physics, geology, etc.; in the latter this is not required. But although the following is fuller than may be necessary in a classification dealing with purely geographical works, it may be depleted by the withdrawal of groups of the second order without affecting the general scheme.

Classification of Geography, with Arbitrary Symbols.

G GEOGRAPHY IN GENERAL

Gα MATHEMATICAL GEOGRAPHY IN GENERAL
- aa Geodesy
- b Latitude and longitude determination
- c Surveying
- d Navigation
- e Time standards
- f Cartography in general
- f1 *Projections*
- 2 *Representation of features*
- 3 *Relief maps*
- g Globes, telluria, etc.
- h Geographical instruments

Gβ PHYSICAL GEOGRAPHY IN GENERAL

Gβa Geophysics in general
- a1 *Internal temperature*
- 2 *Volcanic phenomena*
- 3 *Earthquakes*
- 4 *Earth-movements*
- 5 *Terrestrial magnetism*

Gβb Geomorphology in general
- b1 *Volume-relations of heights and hollows*
- 2 *Mountains and plateaux*
- 3 *Mountaineering*
- 4 *Glacial phenomena*
- 5 *Valleys*
- 6 *Coasts*
- 7 *Islands*
- 8 *Plains*
- 9 *Coral formations*
- 10 *Dunes and loess movements*
- 11 *Caverns*
- 12 *Geological formations* (e.g. *geological maps*)

Gβc Climatology in general
- c1 *Distribution of pressure and wind*
- 2 *Distribution of air-temperature*
- 3 „ „ *rain and snow fall*

Gβd Oceanography in general
- d1 *Tides*
- 2 *Ocean currents*
- 3 *Temperature and salinity of water*
- 4 *Oceanic deposits*

βe Land waters in general

Gβ PHYSICAL GEOGRAPHY IN GENERAL *—continued.*
- e1 *Springs and underground water*
- 2 *Rivers*
- 3 *Lakes*

Gγ BIO-GEOGRAPHY IN GENERAL
- γa Phyto-geography
- b Zoo-geography
- c Oceanic life

Gδ ANTHROPO-GEOGRAPHY IN GENERAL

δa Ethnography in general
- a1 *Races of man*
- 2 *Religions and customs*
- 3 *Migrations*

δb Historical geography in general
- b1 *Development of geographical theory*
- 2 *Ancient discovery (to Ptolemy)*
- 3 *Mediæval discovery (to 1450)*
- 4 *Discovery (1450–1600)*
- 5 *Modern discovery (1600 to date)*
- 6 *Biographies of geographers*

δc Political geography in general
- c1 *Boundaries*
- 2 *Colonization*

δd Commercial geography in general
- d1 *Natural distribution of commodities*
- 2 *Ocean-routes and coaling-stations*
- 3 *Roads and railways*
- 4 *Canals and inland navigation*
- 5 *Tariffs and international trade*

δe Medical geography

δf Place-names

δg Geographical education in general
- g1 *Methods of primary education*
- 2 „ *advanced education*
- 3 *Geographical text-books and atlases*
- 4 *Appliances for teaching geography*

δh Geographical bibliographies, catalogues, etc.

Special Geography.

(*Topographical Divisions.**)

A The World as a whole
Aa General distributions
b Gazetteers, etc.

B The Land as a whole
Ba The British empire
b The Russian empire
c The Turkish empire
d The Dutch colonies
e The French colonies
f Travels round the world

C Europe in General
Ca Iceland
(bc Scandinavian peninsula)
b Norway
c Sweden
d Denmark and Færoes
d1 *Denmark*
2 *Færoes*
(cder Baltic shores)
e German Empire as a whole
e1 *Prussia*
2 *Saxony*
3 *Wurtemberg*
4 *Alsace-Lorraine*
5 *Baden*
6 *Bavaria*
7 *Other states*
f Holland
g Belgium
h France and Corsica (to be subdivided)
i British Islands
i1 *England*
2 *Wales*
3 *Scotland*
4 *Ireland*
5 *Isle of Man*
6 *Channel islands*
(jk Iberian peninsula)
j Spain
k Portugal
l Pyrenees (including Andorra)
m Italy
m1 *Continental Italy*
2 *Sicily*
3 *Sardinia*
n Alps
o Switzerland
(pq Austria-Hungary)
p Austria
p1 *Alpine provinces (Tyrol, Salzburg, Carinthia, and Carniola)*
2 *Coastland and Dalmatia*
3 *Upper and Lower Austria*
4 *Bohemia and Moravia*
5 *Galicia and Bukovina*
6 *Bosnia and Herzegovina*

C Europe in general—*continued.*
q Hungary
q1 *Croatia and Slavonia*
2 *Hungary proper*
3 *Transylvania*
r Russia in Europe
r1 *Northern Russia*
2 *Finland*
3 *Baltic provinces*
4 *Western provinces*
5 *Central and southern provinces*
6 *Ural provinces*
(s-x Balkan peninsula)
s Rumania
t Servia
u Bulgaria
v Montenegro
w Turkey in Europe
x Greece
y Crete
z Mediterranean shores

D Asia in general
Da Russia in Asia
a1 *West Siberia*
2 *East Siberia (including Sakhalin)*
3 *Caucasus*
4 *Trans-Caspian and Turkestan (including Khanates)*
b Turkey in Asia
b1 *Islands off Asia Minor (including Samos)*
2 *Asia Minor and Armenia*
3 *Syria and Palestine*
4 *Mesopotamia*
5 *Turkish Arabia*
c Arabia, independent
d Cyprus
e Persia
f Afghanistan
g Baluchistan
h Himalayas as a whole
i Indian Empire
i1 *Himalayan states*
2 *Punjab*
3 *N.W. Provinces and Oudh*
4 *Bengal*
5 *Assam*
6 *Bombay*
7 *Central India*
8 *Haiderabad*
9 *Mysore*
10 *Madras*
11 *Burma*
12 *Maldives and Laccadives*
13 *Andaman islands*
j Ceylon
k Siam

* In a large collection of titles, each of the following special subdivisions would be farther subdivided into the foregoing *general* groups.

D ASIA IN GENERAL—*continued.*
- *l* French Indo-China
- *l1* *Tonkin*
- 2 *Annam*
- 3 *Cambodia*
- *m* Chinese Empire
- *m1* *China proper and Manchuria*
- 2 *Mongolia*
- 3 *Eastern Turkestan*
- 4 *Tibet*
- *n* Korea
- *o* Japan, including Formosa, Bonin, and Kuriles
- *p* Malay States and Straits Settlements
- *q* British Borneo
- *r* Dutch East Indies
- *r1* *Sumatra*
- 2 *Java*
- 3 *Dutch Borneo*
- 4 *Celebes*
- 5 *Moluccas*
- *s* Phillipines

(*qrs* Malay Archipelago to Wallace's line, as a whole)

E AUSTRALASIA
- *Ea* Australia in general
- *b* Queensland
- *c* New South Wales
- *d* Victoria
- *e* South Australia
- *e1* *The Province*
- 2 *Northern territory*
- *f* Western Australia
- *g* Tasmania
- *h* New Guinea as a whole
- *h1* *British*
- 2 *Dutch*
- 3 *German*
- *i* New Zealand
- *j* New Caledonia and Loyalty islands

F PACIFIC ISLANDS IN GENERAL
- *Fa* Micronesia
- *a1* *Ladrones*
- 2 *Caroline and Palau islands*
- 3 *Marshall islands*
- 4 *Gilbert islands*
- 5 *Ellice islands*
- *b* Melanesia
- *b1* *Bismarck Archipelago*
- 2 *Solomon islands*
- 3 *New Hebrides*
- *c* Fiji
- *d* Polynesia in general
- *e* Hawaii
- *f* Central Polynesian sporades
- *g* Western Polynesia
- *g1* *Tukelau islands*
- 2 *Samoa or Navigators islands*
- 3 *Tonga or Friendly islands*
- *h* Southern Polynesia
- *h1* *Tubai or Austral islands*
- 2 *Cook or Hervey islands*
- *i* Eastern Polynesia

F PACIFIC ISLANDS IN GENERAL—*cntd.*
- *i1* *Marquesas*
- 2 *Society islands, including Tahiti*
- 3 *Paumatu or Low Archipelago*
- 4 *Easter island*

GHI AMERICA AS A WHOLE

G NORTH AMERICA AS A WHOLE
- *Ga* Dominion of Canada
- *a1* *Nova Scotia*
- 2 *New Brunswick*
- 3 *Prince Edward island*
- 4 *Quebec*
- 5 *Ontario*
- 6 *Manitoba*
- 7 *North-West Territories*
- 8 *British Columbia*
- 9 *Labrador*
- 10 (*Canadian Rocky mountains*)
- *b* Newfoundland
- *c* Alaska
- *d* United States

(With over fifty numbered subdivisions into states and other districts)
- *e* Mexico
- *f* Rocky mountains as a range
- *g* Great Lakes of the St. Laurence

H CENTRAL AMERICA AND WEST INDIES IN GENERAL
- *Ha* Central America in general
- *b* Guatemala
- *c* Honduras
- *d* British Honduras
- *e* San Salvador
- *f* Nicaragua
- *g* Costa Rica
- *h* West Indies in general
- *i* Cuba
- *j* Jamaica
- *k* Haiti island
- *k1* *Haiti*
- 2 *San Domingo*
- *l* Bahamas
- *m* Porto Rico
- *n* Virgin islands (Danish)
- *o* British Leeward islands
- *o1* *Virgin islands (British)*
- 2 *Anguilla*
- 3 *Antigua*
- 4 *Barbuda*
- 5 *St. Kitts*
- 6 *Nevis*
- 7 *Montserrat*
- 8 *Dominica*
- *p* British windward islands
- *p1* *Sta. Lucia*
- 2 *St. Vincent*
- 3 *Grenada and Grenadines*
- *q* French West Indies
- *q1* *Guadeloupe*
- 2 *Martinique*
- 3 *Smaller islands*
- *r* Barbados
- *s* Trinidad and Tobago
- *t* Dutch West Indies

I SOUTH AMERICA IN GENERAL
a (Andes as a whole)
b Colombia
*b*1 *Isthmus*
2 *Cordillera and coast*
3 *Llanos*
c Ecuador
d Peru
*d*1 *Coast*
2 *Sierra*
3 *Montana*
e Bolivia
*e*1 *Sierra*
2 *Yungas*
f Chile
g Tierra del Fuego as a whole
h Argentine Republic
*h*1 *Patagonia*
2 *Pampas*
3 *Chaco*
i Uruguay
j Paraguay
k Brazil
(divided into 18 states)
l French Guiana
m Dutch Guiana
n British Guiana
o Venezuela

K AFRICA IN GENERAL
K*a* Morocco
b Algeria and Tunis
c Atlas range
d Tripoli
e Egypt
*e*1 *Lower Egypt*
2 *Upper Egypt*
3 *Egyptian Sudan*
f Sahara (beyond boundaries of countries)
g Spanish West Africa
h French West Africa
*h*1 *Senegal*
2 *French Sudan*
3 *French Guinea*
4 *Ivory Coast*
5 *Dahomey*
i British West Africa
*i*1 *Gambia*
2 *Sierra Leone*
3 *Gold Coast*
4 *Lagos*
5 *Niger Coast Protectorate*
6 *Niger territories*
j Sudan in general
*j*1 *Eastern Sudan*
2 *Upper Guinea and bend of Niger*
k Liberia
l German West Africa
*l*1 *Togoland*
2 *Cameroons*
m French Congo
n Congo State
o Portuguese West Africa
p German South-West Africa
q British South Africa

K AFRICA IN GENERAL—*continued.*
*q*1 *Cape Colony*
2 *Natal*
3 *British Bechuanaland*
4 *South African protectorates (to Zambesi)*
r Boer Republics
*r*1 *South African Republic (Transvaal)*
2 *Orange Free State*
p–s South Africa in general
s Portuguese East Africa
t British Central Africa
u Madagascar
v German East Africa
w British East Africa
*w*1 *Zanzibar and Pemba*
2 *Mombasa and coast to Lake Rudolf*
3 *Uganda and Unyoro*
x Somaliland
y Abyssinia and Galla Land
z East African Lake Region

L POLAR REGIONS IN GENERAL
L*a* Arctic regions in general
*a*1 *Franz Josef Land*
2 *Spitsbergen, Jan Mayen, and Bear island*
3 *Greenland*
4 *Smith's Sound region*
5 *Arctic archipelago north of America*
6 *Bering Strait region*
b Antarctic regions in general
*b*1 *Grahamsland and neighbouring region*
2 *Victoria Land and neighbouring region*

M THE SEA AS A WHOLE

N ATLANTIC OCEAN as a whole
N*a* North Atlantic in general
b Eastern seas, etc.
*b*1 *Barents sea*
2 *White sea*
3 *Kara sea*
4 *Norwegian sea*
5 *North sea*
6 *Baltic sea*
7 *Bay of Biscay*
8 *Mediterranean sea*
9 *Black sea*
10 *Gulf of Guinea*
c Western seas, etc.
*c*1 *Davis strait*
2 *Hudson bay*
3 *St. Lawrence bay*
4 *Gulf of Mexico*
5 *Carribbean sea*
d North Atlantic islands, etc.
*d*1 *Azores*
2 *Newfoundland banks*
3 *Bermuda*
4 *Madeira*
5 *Canaries*
6 *Cape Verde island*

N	Atlantic Ocean as a whole—*continued.*
e	South Atlantic in general
f	South Atlantic islands
*f*1	*Ascension*
2	*St. Helena*
3	*Fernando Noronha*
4	*Trinidad (islet)*
5	*Tristan da Cunha*
O	Indian Ocean in general
O*a*	Red sea
b	Persian gulf
c	Arabian sea
d	Bay of Bengal
e	Andaman sea
f	Mozambique channel
g	Sunda-Australian bight
h	Great Australian bight
i	Oceanic islands
*i*1	*Chagos archipelago*
2	*Mauritius*
3	*Réunion*
4	*Rodriguez*
5	*Seychelles*
6	*Keeling island*
7	*Amsterdam and St. Paul islands*
8	*Christmas island*
P	Pacific Ocean in general
P*a*	North Pacific
b	Bering sea
c	Sea of Okhotsk
d	Sea of Japan
e	East China sea
f	Yellow sea
g	South China sea
h	Celebes sea
i	Pelew sea
j	South Pacific
k	Sunda sea
l	Sulu sea
m	Banda sea
n	Arafura sea
o	Coral sea
p	Tasman sea
Q	Southern Ocean in general
Q*a*	Antarctic sea
b	Oceanic islands
*b*1	*Gough island*
2	*Sandwich islands (south)*
3	*South Georgia*
4	*South Orkneys*
5	*South Shetlands*
6	*Bouvet island*
7	*Crozet island*
8	*Kerguelen island*
9	*MacDonald and Heard islands*

HYDROGRAPHY OF THE UNITED STATES.*

By FREDERICK HAYNES NEWELL, Hydrographer U.S. Geological Survey.

In considering hydrography as a branch of geography, it may be claimed that the period of exploration has passed. The location of nearly every stream or source of water is fairly well known and represented on the ordinary maps of states and counties. The next stage of progress, that in which accurate information is obtained as to volume and fluctuations of the water resources, may be said to be fairly entered upon. In few localities, however, can it be held that there exists information concerning the waters sufficiently definite to suffice for ordinary engineering or civic requirements, excepting possibly in the case of some of the principal harbours and larger navigable streams.

The Field of Investigation.

The territory to be studied in obtaining a knowledge of the hydrography of the United States is not only large, but is highly diversified in character. The problems encountered have great variety not only in kind, but in magnitude of scope, and in practical application. While intimately connected in some respects, the subjects of hydrographical study have a natural classification based largely upon geographical divisions, the western or arid part of the country demanding investigations differing widely in purpose from those of the eastern or humid sections. In following out this classification, the rivers of the Atlantic slope, taken in order from north to south,

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come first; then the Mississippi river and its tributaries from the Appalachians westerly to the Rocky mountains; then come the Texan or Gulf streams, including the Rio Grande; then next to these the great Colorado river, flowing south-westerly into the Gulf of California; after these may be taken up the lost rivers, or the drainage of the vast interior basin of the continent from which no streams escape to the ocean; and, finally, the Columbia and other rivers flowing into the Pacific, the most notable of these being the Sacramento and its tributary the San Joaquin.

The Purposes of Investigation.

The direct objects of the various investigations bearing upon the hydrography of the country are distinctly economic. Each has in view the accomplishment of some result which shall render available to a larger degree the natural resources, adding to the wealth, comfort, or health of the people. Indirectly, however, facts of broad scientific interest are developed, though the work may not have been planned to this larger end. It is well to keep in mind the object or motive of the various classes of work in order to better comprehend the causes of deficiencies or want of symmetry of the resulting body of facts.

The first in time, if not in importance, of the objects of hydrographical investigation are undoubtedly those pertaining to navigation. Since the period of the first discovery of the continent, explorations and minute mapping of the shores, harbours, and navigable rivers, have been almost continuously carried on. The body of facts thus accumulated is in what may be termed a complete form, requiring for the most part merely the continual revision and refinement necessitated by changing conditions and by the more exacting demands of commerce. The methods and results of the surveys of navigable waters are so well known, and have been so widely extended throughout the world, that comment here is not necessary.

Next to the demands of commerce for information concerning waters are those of manufacture. In the former case water furnishes the means of transporting the goods, and in the latter, through its motion in the descent from higher to lower levels, furnishes power to drive the complicated machinery which has replaced manual labour. It would be a comparatively trivial matter to ascertain the extent and value of available water-powers if the streams continued with unvarying flow through seasons and years, but with their constant fluctuations day by day, the problem becomes one requiring years of measurement to determine what may be considered as the available or economic power to be realized. At certain seasons of the year the amount of water is vastly in excess of any possible utilization, and then is a source of danger to structures and to population. At other times the quantity drops below the capacity of the water-wheels or other machinery, and storage of flood-waters must be resorted to. In contemplating a new enterprise, it is necessary to know the range in the behaviour of a stream through many years in order to determine the necessary dimensions and strength of structures to be erected, and to make suitable provisions for tiding over the times of deficient supply. The question of probable profit or loss may be determined by the record of a few days' low water in the past. In illustration may be cited the case of a great water-power enterprise for which capital had been raised and thorough examinations made. It was found, however, that no trustworthy records could be found of the behaviour of the river in the past, but the assumptions of the engineers, based on incomplete data, seemed to show that the possible short period of low water might eat up the profits of the enterprise. The project was therefore abandoned. The phenomenally low water of subsequent years, however, never reached the minimum predicted, and it is now obvious that, had the works been erected, failure would not have resulted from this cause. The utilization of the water-power of the country demands,

therefore, the most careful examination conducted through many years, so that on the one hand costly experiments may be obviated, and that on the other these natural resources may not be undervalued.

In the United States there has arisen a third demand for knowledge of the water resources which in political and social importance ranks even above the needs of navigation and manufacture. This is through the extension and higher development of agriculture by the artificial application of water. The nation as a whole has been, and still is, a great landowner, having now in its possession and at the disposal of Congress one-third of its area, not considering Alaska. This one-third includes some of the richest and most fertile areas of the continent. It is for the most part open to settlement and private acquisition under what is known as the Homestead Act, but it is practically unavailable to the settler, usually a man of small means, because of the fact that the climate prevailing throughout the vast extent of public land is too arid to allow of the growth of ordinary farm crops. Irrigation must be practised, and, where employed, has been notably successful and remunerative; but the supply of water is scanty, and in many cases, before an acre of the best land can be cultivated, enormous expenditure must be made in the construction of reservoirs, canals, and ditches, putting it beyond the power of farmers or groups of farmers to make even a beginning.

Throughout the greater part of the western half of the United States all land values are dependent upon the ability to secure perennial supplies of water. The fluid, which in the east is in excess, and in many localities is literally free as air, becomes, as the supply diminishes, a valuable commodity. A spring of moderate capacity, found within the arid region, may be more highly prized than a mine of precious metal. It is a never-ending source of revenue. The limitation of the supply of moisture puts a premium upon careful farming, for with the warm cloudless days and the application of a proper amount of water, combined with thorough cultivation, the largest results are obtained from the minimum acreage. Economy of effort and density of population are thus favoured by the employment of water in agriculture.

The utilization of the vast extent of fertile public land is a question of great national importance, not only from the standpoint of the citizen as owners of the land, but from many other sides. The arid lands now desert are capable of furnishing homes for a population of millions, and, if properly utilized, will serve for many decades as an outlet for the congested population of the eastern cities, furnishing a possible solution for some of the most pressing social problems of the day. Before plans involving the utilization of these lands can be made, it is necessary, however, to obtain accurate knowledge as to the available water-supply both above and below ground, and of possibilities of conserving floods and of raising water by machinery from lower to higher levels. With the fluctuations which take place from year to year, it is obvious that such investigations must be continued for times sufficiently great to give the ordinary range of conditions.

There is yet another series of investigations which, though individually of local concern, are yet found wherever civilization progresses. These pertain to the supply of water for domestic and municipal use. The quantities to be secured are relatively small, almost insignificant in comparison with those required for navigation, water-power, or even for irrigation, the supply of water for a city of ten thousand people being not greater than that needed to irrigate a farm of 150 acres. But while the quantities are small the quality is of prime importance, for upon it depend matters of life and death to communities. As a rule each city or town, or in the country each family, makes its own investigation regarding sources of water, but as population increases the opportunity of enjoying an

unpolluted source of supply rapidly decreases. Especially is this the case with cities which from their location are compelled to draw water from streams flowing for a considerable distance, and possibly crossing state lines. Such streams, in our present state of civilization, receive with the drainage of the country the sewage from towns and institutions, together with the offscourings and refuse of all descriptions. The time is rapidly approaching when vigorous steps must be taken to prevent stream pollution, and in the mean time a thorough knowledge must be obtained of all possible sources of supply.

Passing over many minor demands for hydrographical investigation, there may be taken up, as of general interest, the class of facts geological in character which pertain to the eroding and transporting power of running water. These matters have interest, however, not only to the student of geology tracing out the operations by which the present aspect of the Earth has been produced, but also to the engineer who is concerned with the stability of Earth and rock, and the formation of bars or obstructions in rivers or harbours. Comparatively little observation has been directed specifically to such matters, investigators being content with the derivation of a few somewhat empirical formulæ as to the ability of streams to carry material of certain form and weight.

The Investigation.

From the foregoing abstract of the objects of hydrographical investigations, it is obvious that such work must be carried on by many men and by various methods. With the rapid development of the country, and the impossibility of predicting future needs, it has been impracticable to lay out broad lines of research, and field-work has, in fact, been devoted to the purposes of the moment. In reviewing the results that have been attained, it may properly be claimed that the pioneer efforts on the one hand are traceable to the efforts of Thomas Jefferson in his advocacy of the establishment of scientific surveys, later realized in the operations of the Coast and Geodetic Survey. On the other hand, as applies to the hydrography of the country at large, the foundations may be said to have been laid by the Smithsonian Institution. The history and operations of the Coast and Geodetic Survey have been so fully discussed by others, that it is not necessary, at this time and place, to enter upon them, and the importance of the achievements of this organization call for more space than can here be given.

Brief reference only can be made to the work of the Smithsonian Institution, the mother of many important governmental bureaus of investigation. It has apparently been the policy of the guiding spirits of this institution, in their attempts "to increase and diffuse knowledge among mankind," to inaugurate scientific work on all lines, and when any one investigation attained a growth such that public interests ensured its continuation, to dismiss from the parent home this offspring as a separate bureau—usually attached to some one of the executive departments. In this way the Fish Commission—an independent organization—took its origin; also the Weather Bureau, now a part of the Department of Agriculture; possibly the Geological Survey, one of the bureaus of the Department of the Interior, may also be traceable to the explorations fostered and encouraged by the Smithsonian funds. It is apparent that the first systematic studies of the water resources of the United States, and the discussion of their possibilities and limitations, is due to the stimulation afforded by this institution. Work of this character has, however, been almost entirely abandoned by the Smithsonian, because of the fact that original research in this line has been taken up systematically by younger organizations.

The construction of public works for coast defence and for the improvement of navigation has been entrusted to the supervision of engineer officers of the army. The preliminary work of ascertaining physical conditions has necessitated the acquisition of a considerable body of facts in regard to the rivers and harbours, especially in the immediate locality of points where works of improvement are undertaken. The study of hydrography carried on under such conditions is of necessity fragmentary and incomplete, but it is yielding data which, when rounded out and supplemented, must be of inestimable value in the progress toward better knowledge. Each year is adding to the accumulation of data, through the maintenance of tidal gauges and of observations of river height on navigable streams—such, for example, as the Mississippi, Missouri, Ohio, and their principal tributaries, and the larger rivers entering the Atlantic and Pacific oceans. Besides these operations, and the surveys of the Mississippi and the Missouri rivers, various engineer officers are from time to time making special examinations of streams large and small, reporting upon the practicability or advisability of removing obstructions and of providing locks and dams for maintaining navigable stages during times of low water. The information thus had, is, for the most part, published in the annual reports of the Chief of Engineers.

The work of the Weather Bureau, in many of its divisions, is of prime importance to the knowledge of the hydrography of the country. It lies at the root of the matter in that, through the records of precipitation, facts are obtained as to the distribution of rainfall over the surface of the land. These observations are being carried on at many hundreds of localities, a few of these being at stations provided with trained salaried officers, but, for the most part, through co-operation of persons who voluntarily give their time to the measurement and recording of rainfall, and also of changes of temperature. In addition to this, the bureau maintains, on a number of the more important streams, a system of gauges under the charge of local paid observers, these being so placed as to give information concerning the rise and fall of the streams at localities where the information will be of value in making flood predictions. The system of warnings based upon these observations has proved of great value, not only to commerce, but also to all of the inhabitants within areas liable to inundation. Through the notices timely given, it has been possible to save from destruction property valued at many thousands of dollars, and doubtless many lives. These observations are as a rule continued only during the flood season, and are discontinued throughout the winter, especially in the case of rivers covered with ice during a great part of this season.

The investigations of the Geological Survey, through its Division of Hydrography, are designed to give a general yet thorough knowledge of the distribution of water throughout the country—both above and below ground—its fluctuations in quantity from time to time, and the factors which govern its availability in contributing to the prosperity of the citizens. In view of the limited resources available for the purpose, it is not practicable to measure all streams, or to carry on studies of underground waters in all places, but attempts are made to select the more important or typical localities, and obtain facts which will be not only of local value, but have a broader application. There are two classes of work involved: one of a somewhat simple engineering character, consisting of measurements of the discharge of rivers at designated points, and computations of the daily flow; the other less direct, necessitating a thorough examination of geological conditions, and the bearing of these upon the occurrence of water and its motion underground.

The measurement of water in the river differs from the ordinary meteorological

operations in that we are dealing with a constantly varying quantity, the natural streams fluctuating from moment to moment often by perceptible amounts. Thus extreme accuracy is practically impossible even if desirable, for the amount ascertained for one hour in the day on a given date may not again be equalled in a decade. A considerable number of measurements, whose errors, though relatively large, are not cumulative, must therefore be made, and at times and seasons when they are representative of prevailing conditions. The expense, however, of frequent measurements is usually prohibitory, and therefore a further method of approximation must be employed, this consisting in maintaining continuous observations of the height of water of the stream, or daily or periodical records made at intervals so short that there can be no extreme variation between them. This is the course adopted, the assumption being that the quantity of water in a given stream in a general way follows the height upon a fixed gauge. That assumption, however, is in error wherever a stream is eroding or modifying its channel to a notable degree. Then the height of water means little or nothing unless taken in connection with the shifting form of cross-section.

The operation of river-measurement, as now carried on, consists in establishing a gauge at some point favourable for measurement and for observation. Readings of height of water are made, and records are transmitted to the local engineers or hydrographers; at intervals of a few weeks the hydrographer visits the stations under his charge, measures by means of a suitable device—usually an electrically recording current-meter—the velocity of the water, obtains by direct measurement the depth and width, and from these facts computes the discharge for the height at which he happens to find the stream. The results thus obtained are assembled, and from measurements made when the stream is at high and low stages and at intermediate points a graphical curve is constructed, representing what may be termed average relationship between height of water and quantity flowing. From this curve a table is constructed, which gives the ordinary flow for each tenth of foot at which water stands on the gauge. The table is used in converting the daily record of height into a statement of discharges, from which may be had the maximum, minimum, and average flow for any particular month or year. Such river stations are being maintained at about a hundred and fifty localities, these being for the most part in the western half of the United States, where the question of water-supply has an immediate bearing upon the utilization of the arid public domain. Where the channel of the stream is of such an unstable character that these simple operations are not applicable, more frequent direct measurements of discharge must be made, as it is usually impracticable to attempt to improve or rectify the channel for the purpose of measurement.

A knowledge of underground waters is based upon a systematic examination of the materials which form the outer covering of the Earth. In order to obtain facts concerning the quantity and quality of the contained water and of its probable hydrostatic pressure, it is essential to know not only the topographical structure, but also the attitude and character of the rocks for a considerable distance beneath the surface. Operations are being carried on mainly within the Great Plains region, where living streams are rare, and where the surface of the ground is so nearly level that it is impracticable to store water in reservoirs or tanks. Here wells must be depended upon to a large extent to furnish not only drinking-water, but the supply necessary for cattle and for the cultivation of gardens and shade trees about the homes of the people. In this country, characterized by uniformity, the rocks are continuous in character over great areas, and examinations involving a considerable portion of the continent must be made before local matters can be determined. The underground structure, however, is not as simple as might be

inferred from the surface, for the older and deeper rocks have in many places been decidedly flexed, or even faulted, especially at points near the foothills. Thus, while predictions can be made as to the thickness of the rocks over considerable areas, and the depth to certain water-bearing strata, yet these statements must be carefully checked by a thorough search for interrupting causes.

The method of work consists in careful examination of the surface rocks of all places where outcrops may be expected, and the collecting and comparison of records of wells, especially those of notable depth. The exposure of the upturned edges of the Plains rock against the mountains affords opportunities of the estimation of the thickness, and this in turn is checked by the examination of outcrops in ravines and by measurements obtained from deep wells. The character of the containing beds must be determined from those outcrops and from the borings, and, in short, every available fact and inference must be utilized in adding to the mass of information.

Results.

The results of the various branches of hydrographical investigation, when rounded out, give a complete history of the progress of the cycle of existence of water in the form of fluid, from the time it reaches the Earth as rain until it is again returned to the air by evaporation, or fixed more or less permanently in the tissues of plants or the rock-crust of the Earth. This life-history embraces not only the progress of the water from point to point, but also its quantity, distribution, extent, and depth in the rivers and lakes and on the navigable coasts. The progress of events in such a history can be discussed under several heads, the principal of which are the quantity and distribution of the rainfall, the amount of water which runs off the surface of the ground forming streams, commonly known as run-off; next, the portion which is early evaporated from the soil or from plants growing in it; and, lastly, that which sinks underground, percolating for considerable distances to form relatively permanent underground waters, or to reappear, in part at least, in springs and ordinary or artesian wells.

The great body of facts thus far acquired, consist of measurements of rainfall made by the Weather Bureau, or records of river height kept by this organization and by various officers of the army, together with occasional discharge measurements made at irregular intervals. With this are the measurements and computations of daily and monthly discharge of various streams resulting from the field work of the Geological Survey, and a considerable body of facts relating to the occurrence and movement of water underground, resulting from the studies of various geologists. This somewhat heterogeneous mass of material is being digested as rapidly as possible by the Division of Hydrography of the Geological Survey, with the intention of preparing a systematic description of the hydrography of the United States.

One of the first results to be attained, but for which many more facts should be had, is the relation existing between rainfall and run-off under various conditions of topography and culture. Tentative conclusions have been drawn and expressed in the form of simple diagrams. If all the rain that fell upon the surface flowed off in the streams as from a roof, then with, say, 40 inches of annual rainfall there would be an equivalent depth of 40 inches of annual run-off; but, as a matter of fact, from the ordinary mountainous country only about 30 inches in depth of run-off may be expected, and from surfaces of less relief, as the rolling prairies and foothills, about 15 inches in depth of run-off per year. On the other hand, with 20 inches of rainfall, the amount running off from the mountainous country is approximately 7 inches, and from the prairies 2 inches. With half as much rainfall, or 10 inches in depth,

only about 2 inches per year can be expected from the mountains, and practically nothing from the plains. In other words, with a mean annual rainfall of less than 10 inches, or from 10 to 15 inches, no living streams can be expected outside of the mountains, and, as shown by the map of the United States, rivers rising in regions of such aridity disappear upon reaching the lowlands, so that the arid region of the west is characterized by its lost streams.

Another set of results being obtained is in regard to the average discharge of the rivers of the country. It is recognized that with the great seasonal and climatic oscillations that take place the streams have great range, and may never flow for any considerable length of time at their average rate, but, nevertheless, even with these wide and irregular variations it is a matter of considerable moment to know what has been, for a period of ten years or more, the average discharge of the streams at certain points. This average discharge, when represented diagrammatically on a map, enables the student to see at a glance the relative importance of various rivers, as well as their length and position.

Having ascertained approximately the average quantity of water carried by rivers at various portions of their course, it becomes practicable, using this as a base, to study the variations from this mean, and to have a standard by which to express the relative quantity of floods or the relative deficiency of droughts. The intensity and duration of these are matters of great importance, both in their practical and scientific application, and can only be satisfactorily discussed when results have been obtained covering a considerable range of time. When such data have been assembled and arranged for convenience of reference, it will be possible for individuals, officials, engineers, or promoters to discuss the practicability of enterprises designed to add to the health, comfort, or wealth of the people.

SCIENTIFIC GEOGRAPHY FOR SCHOOLS.*

By RICHARD E. DODGE, Professor of Geography, Teachers' College, New York.

I PROPOSE, in the time at my disposal, to offer one or two suggestions for improving the geography work in our common schools, which at present here in America, and particularly in the United States, is recognized as the poorest-taught subject in the curriculum. While other subjects have undergone tremendous changes in the last few years, geographical teaching has remained practically dormant until within the decade. Much is being done at the present time in the line of so-called improvement, but a great deal of the energy is, to my mind, misapplied, because it is unscientific and superficial. My excuse for bringing this subject before a meeting composed so completely of scientists is because the teachers of this country need scientific help if they are ever to improve the work in geography. Many scientists fail to realize that the reason why their scientific labours are so little appreciated is because they themselves have neglected to train the public spirit, which should follow them and be interested in them. We have in the United States a few scientific geographers who are aiding greatly school teachers and pupils, working arduously and earnestly with the hope of doing some good in this generation and more in the next. Those of us who are making this task our life-work, while we are at the same time attempting to do something in scientific geography, feel that

* Paper read in Section E (Geography) at the Toronto Meeting of the British Association, August, 1897.

we need the help and the interest of every geographer in this country and abroad, if we are to produce the results we so eagerly wish for in making geography hold the place in the minds of the people that by right belongs to it.

Until within a few years, the geography taught in the schools has been very largely what is termed "sailor geography." It trained the mechanical memory and gave a vast knowledge of details, often of little use to the learner, to be forgotten as soon as school was out. This old form is now giving way to what is commonly called "rational" geography, in which the child is taught to reason, and in which the subject is made to become a mental stimulus. There is still room, however, for great improvement. At present there is a great deal of argument among school superintendents and principals as to the psychological position of geography, as to its ability to produce mental training, and as to the stage of mental development at which it can best be introduced. Those of us who have the cause of geography so thoroughly at heart need not stop to discuss this subject. We are thoroughly convinced that geography is as capable of mental training as any other science. If we are in doubt, we can be reassured by reading the excellent papers of Mr. A. J. Herbertson * and Mr. B. B. Dickinson,† which have appeared in the last year.

Leaving aside, then, the question as to the power of geography, let us see what the aims of geographical education are and what they should be. Hitherto the aim has been to give a knowledge of the world in its relation to man, and in some cases a knowledge of the world with very little thought of man. Now, we recognize that the teacher has not accomplished his task or fulfilled his duty thoroughly until he has trained his pupils in the ability to gain more education after they have left him than they have gained with him. They must leave school with the ability to study, to interpret, and to apply; with the power of gaining knowledge for themselves from maps, text-books, encyclopædias, books of travel, and all other sources of geographical information. If the end to be sought by geographical teaching is the power of knowing and applying one's self, then surely this power is more important than mere information. Incidentally, geography should train the pupils in an understanding of the features of the Earth, of their origin and structure, of their life-histories and their ends; it should develop in the pupils a love for nature and out-of-doors, a desire to study geography first hand and to come in contact with the Earth; it should leave them in a questioning spirit and with the power of thought.

All these points have been more or less dwelt upon by our teachers and geographers, but there is another point concerning which we hear less, and it is this: that the training in geography should be along scientific lines, and should lay the basis for scientific thought which the pupils may use in the later years. If the three steps which any scientist must follow, before he comes to a decision, are those of observation, inference, and proof, then our training is unscientific if we stop with mere observation and the study of relationships. We should early develop in our children the power of prophecy, and, what is further, the power of proving the prophecy. By prophecy I do not mean guessing, but I mean the power of foretelling the relationship of man to any part of the world from the study of a good

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* 'On the Importance of Geography in Secondary Education, and the Training of Teachers therein.' By Andrew J. Herbertson. 'Rep. Sixth Inter. Geog. Cong.' (John Murray, London, 1896), pp. 83–87.

† 'Geography as a School Subject (an attempt to show that Geography can be taught as a training of the mind).' By B. Bentham Dickinson. Printed for the Geographical Association, 1896.

map or other representation of that region. From an experience of a few years in teaching, I know that this power of prophecy can be developed early in the child-life, and that it is vastly helpful in the future training of the children. The prophesying, however, must be founded on familiar conditions, and must start in a simple way. We all know that the German custom of making home geography the centre for future study of the world is becoming to be recognized as the true beginning for geographical work. If the home geography is so taught in the early years that the children get an understanding of the causal conditions, it becomes a basis for the study of prophetic geography later.

From the home geography we should go to a map representation of the facts, and from the home maps to maps of other regions drawn in a similar way. From these latter maps the pupils should be able to read the physical conditions, and to prophesy from these conditions certain great lines of geographical development. Climatic conditions, the lines of drainage, the character of the topography, the altitude, the occupations of the people, the places of residence, the manner of life, the lines of communication by water or rail—or the lack of them—the probable position of the great centres of population, and many other points, should at once be suggested to the child as the only results possible under such conditions.

In this development we have followed two of the steps of scientific reasoning: we have observed the home geography and the conditions abroad, and we have drawn our inferences from these conditions as to what their effects must be. The third step is the proof, the analysis, the decision as to whether the inferences have been true. That proof comes in the study of facts as they are given in the sources of information in the hands of the child or teacher. If these three steps be followed, the children are early led to appreciate the relationship between cause and effect, and to see that all is not chance in the world. Furthermore, they are given a mental stimulus and a training in right thinking that will be a help to them ever after.

During the last two years I have introduced this work into the school with which I am connected—the Teachers' College, New York City—and the results have been more pleasing than I had even expected. Children whose average age was eight years have, after a study of the home geography and a knowledge of the globe shape of the world, taken up a somewhat detailed study of the United States, and from a physical map prophesied simply, and yet accurately, all the conditions which I have suggested above, practically emphasizing the points of climate, drainage, topography, and occupations in the great central plain and mountain regions. In the succeeding grade, where the children average nine years of age, they prophesied from a physical map of Palestine all the primary geographical conditions of that region, and with such extreme accuracy that the teacher carrying on the work was as surprised as I was. This work has been done by teachers not particularly trained in geography, and who have only attempted the new geography within the last two or three years. Of course, much depends upon the ability of the teacher to keep the prophesying of a degree and quality in sympathy with the ability of the child. Naturally more work, and more detailed work, can be accomplished in the latter years than in these years, but these two illustrations show most clearly how it is possible to start scientific thought early in our school work. The teachers in our institution value this work, and recognize that it is going to be extremely important and a very great help in the later work in history, literature, science, etc.

The kind of generalization and the kind of prophecy that is possible in geographical work is different from that in any other line of science, and I feel that we should all make an effort to incorporate scientific geographical teaching in our grade schools. I believe that geographical teaching along the lines suggested is more

scientific than that followed in many of our institutions, and if this line of thought be a valuable one, as I deem it to be, we should do all in our power to assist it. The common school-teacher not being trained as a scientist, it becomes the duty of those whose thought is scientific to help the non-scientific. A great many of the teachers of the United States recognize that the source of help to which they must go are the men scientifically trained as experts in the particular subjects in which they are interested. The geographers of the United States are having a tremendous demand upon them at all times for help and assistance, yet they are so few that their work, important as it is in certain localities, lacks geographical breadth and area.

We need the help of every geographer if we are to secure an immediate improvement in geographical teaching. First we need to persuade the superintendents and those in authority that geography is a science, and capable of giving scientific training. There is much writing and talking on "What is Geography?" but there is less on what it can do. We know what it can do, and we need to prove to others the strength of our position in reference to this subject.

At present there are but a few universities in this country where geography is taught scientifically, and the aid from the scientists must therefore be given to all stages of education, from the earlier to the more mature years. This assistance will, as I have said before, perhaps secure little return in this generation, but surely the next generation will profit thereby.

There are several lines in which scientists can help in geographical work. First and foremost is the necessity that geographers should publish their results in such a form and in such a place that teachers can make use of them. Much that is valuable is now not at the service of teachers, because buried in scientific bulletins and periodicals. Furthermore, many of our geographical results are given to the world in terms unintelligible to the lay reader, because phrased in roundabout statements or unusual words. We need to be more simple, more concise, and hence more clear. Teachers cannot afford the more costly scientific publications, and hence there is need that scientific geography be published in such a form that teachers may have access to it. The writer has endeavoured to do his little in this regard by publishing a journal of school geography,* which, though youthful, has met with such a good success that I think it a sign of the times and of the opportunities of the times. Our pedagogical papers are full of geographical material, but most of it is rubbish, and geographical only in the mind of the writer thereof or by courtesy. Every geographer can assist in this good work, and help the papers of the country by giving them accurate facts.

Yet by this means of assistance alone teachers may become loaded with a mass of facts, dangerous because of their inability to apply it scientifically. Hence scientists can do much, though more local perhaps in its effect, by the giving of courses of definite lectures for the teachers of their neighbourhood. Much is being done, as you know, in this way abroad, and something in this country; but we should all of us be at the task, for in combination only is there a possibility of success.

Again, our schools need better and cheaper maps, more and better models and globes, lantern slides, etc.; and the selection of these should be managed by scientific men. Much credit is due to the work of Mr. B. B. Dickinson and the Geographical Association of Great Britain. Would we had several similar centres of geographical information—geographical information bureaus, if you will—in this country! Here is a chance for beneficial help that needs attention at once.

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* The *Journal of School Geography*, a monthly journal devoted to the interests of the common school teacher of geography. Lancaster, Pa. One dollar a year.

As America is a country which is considered practical, we can help our cause by showing what applied geography is. If the geographers of this country and abroad would produce more publications showing the relation of the geographical conditions to history and progress, to literature and art, to human conditions of all kinds, the science would be helped, and the common people would soon learn to recognize the claims of geography and the need of improving the teaching of it. Prof. Charles R. Dryer, of Terre Haute, Indiana, has led the way in this work in this country by his recent publications of his Studies in Indiana Geography,* and I hope many geographers will soon follow his example in other states.

I have spoken as a teacher and student of teaching, and have tried to show some of the helps we teachers need in our efforts to improve geographical teaching in this country. So far as I know, we have few schools where geography is taught in accordance with the plan I have outlined briefly. The number is increasing annually, however, and there is an ever-increasing demand for teachers of the so-called new geography.

Enthusiastically interested in the cause of geography as a geographer, and recognizing some of the difficulties that teachers have to deal with, I have ventured to summarize these conditions here, that they may receive some discussion, and I hope some recognition. I appeal to you all, therefore, whether you be from across the water or not, to give your active sympathy and cordial co-operation in the vast problem which awaits us—the improvement of geographical teaching along scientific lines.

THE HIGHLAND CONTROVERSY.

After the formal meetings of the Sixth International Geographical Congress came to an end, a number of excursions, organized under its auspices, set out under duly authorized leadership. It may be supposed that each of these started with an equal amount of energy, for the distances traversed were inversely proportional to the members constituting them, the long-distance excursion to the remote highlands of North-Western Sutherlandshire being undertaken by one member of Congress alone—Prof. Penck, of Vienna. Under the guidance of Mr. John Horne, Prof. Penck explored many of the more important districts very thoroughly, favoured by exceptionally good weather; the results of his observations are to be found in a recently published paper, which must be regarded as a very striking contribution to what is already a very voluminous literature, one which seems not unlikely to add yet another to the many "heresy-hunts" which have from time to time beset this troubled region.†

Taking up the matter from the wide standpoint of mere earth-structure, Prof. Penck's attention is first concentrated on the conditions under which the Torridon sandstones were laid down upon the Archæan gneiss, and the first part of his paper consists of a careful examination of the appearances observed along the line of junction of these two formations. The structure of the Torridon breccias, as seen, for example, on the south side of Loch Torridon, on Loch Maree, and at the Gairloch, and the characteristic forms of the surface of the gneiss near Quinag, Loch

* 'Studies in Indiana Geography.' By Charles R. Dryer. Inland Publishing Co., Terre Haute, Ind., 1897. Pp. 113.

† "Geomorphologische Probleme aus Nord-west Schottland." Von Albrecht Penck. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, Band xxxii. (1897), No. 3, pp. 146–191.

Assynt, and elsewhere, are rigorously examined for traces of submarine, lacustrine, or even glacial conditions, and compared with deposits known to have been laid down in any one of these; but in each Prof. Penck finds them wanting. Then follows an inquiry into possible formation by the erosion of pre-Torridonian mountains by running water, but here again the evidence is unsatisfactory; and the surface appearances of the gneiss and the texture of the lower Torridon beds can only be accounted for by supposing the existence of a dry continental climate, the main erosive agents being large changes of temperature, wind, and occasional torrential rains of the "cloud-burst" order. Comparing the situation with that now to be found in the wadis of the Sinai peninsula, recently examined and described by Dr. J. Walther, and photographed by Dr. Natterer, this view is confirmed, and Prof. Penck concludes that the Torridon sandstones were in the first place laid down under arid conditions on a base which had never previously sunk to sea-level.

As time went on the climate became moister, for the Torridon sandstone, like the Dala quartzite of Sweden corresponding to it, bears traces of river-erosion, and with the beginning of the Cambrian period the sea invaded the whole region, bringing with it a highly organized fauna of obviously foreign origin—only, however, after the formation of the most typical "plane of marine erosion" known to the European continent, involving the removal of a great part of the deposits laid down.

The second part of Prof. Penck's paper deals with the bewildering problems of the Ben More and Moine thrust-planes, and here we are confronted with a long and closely reasoned argument very difficult to describe in brief, partly because of its essentially complex nature, and partly because it treats of matters of geomorphology which are commonplace to students of Prof. Penck's great treatise, but are not yet sufficiently familiar here to have established English equivalents. The simplest way seems to be to reverse the order followed by Prof. Penck, and to discuss, as it were backwards, the formation of the type of mountain ranges produced by folding or bending of strata which have been laid down as horizontal sedimentary beds. These bends or folds are assumed to be ultimately due to shrinkage of the globe as a whole, producing lateral pressure, and consequent irregularities of yielding near the outer circumference. But the minute and accurate geological surveys, which alone afford reliable information about the occurrence of such irregularities, are too small in number and too restricted in area to present the phenomena in anything like completeness; hence it is necessary to fall back on experiment on the small scale, a proceeding more than usually risky with so many unknown quantities. Upon the observed changes in thickness and density of strata known to have been subjected to strains of the given type, Prof. Penck bases calculations which lead to the result that the deformations to be considered are restricted to a small thickness of strata near the surface of the earth; and it is, as usual, assumed that the rigidity of these strata decreases from the surface downwards. The experiments of Cadell, Willis, Forchheimer, and others, in which beds of sand, plaster of Paris, etc., arranged so as to be more and more plastic from above downwards, and resting on a rigid surface of wood, were subjected to lateral pressure, are therefore to be accepted as in some degree representing the conditions under which the "fold" type of disturbance has actually taken place.

Prof. Penck devotes a section to an elaborate discussion of these experiments, and although he admits that the line of investigation has not yet been exhausted, he finds that the normal disturbance is as follows: Lateral thrust produces—(1) a surface layer of simple sliding, without distortion (*Ueberschiebungen ohne*

Auswalzungen); (2) an intermediate layer of folding and dislocation recognizable by rotation and inversion of strata (*Faltung mit Faltungverwerfungen, kenntlich durch Auswalzungen und Umkehrungen der Schichtfolge*); and (3) a layer of quite plastic material with primary sliding without rotation or inversion (*ein Niveau mit primären Ueberschiebungen ohne Auswalzungen und Schichtumkehrungen*).

The conditions represented by the surface layer are naturally exposed only where there has been little denudation, and we are referred to the North German plain, where a gently undulating surface is succeeded, at no great depth below the surface, by an extraordinarily involved series of rocks, very puzzling to decipher. The second layer, contorted and faulted so as almost to defy analysis, is laid bare in the Appalachian range, and in the Alps; a double fold peculiarly characteristic forming the Glarus Alps, here specially described. The third and last layer, exposed by practically destructive denudation, is represented by the great thrust-planes of the north-west highlands of Scotland. Each of these layers, as is indicated by the experiments, glides almost insensibly into the one next to it. Prof. Penck here specially describes his personal examination of the second and third.

TO FIND THE ANGLES FROM THE VERTEX OF THE MOON FOR AN OCCULTATION PREDICTED BY MAJOR GRANT'S APPROXIMATE METHOD.*

By E. A. REEVES, F.R.A.S.

In the number of the *Geographical Journal* for June, 1896, there appeared an excellent paper by Major S. C. N. Grant, R.E., in which he describes his graphic and very practical method of predicting the circumstances of an occultation with sufficient accuracy for the purposes of an explorer. This method, although it does not attempt at great precision, will, with moderate care in working, enable a person to determine whether an occultation which is given in the 'Nautical Almanac' will be visible in any place on the Earth's surface of which the latitude and approximate longitude is known, and, if so, will give, within a few minutes, the time of its occurrence. It also provides the means of ascertaining the angle, as measured from the *north point* of the moon, of immersion and emersion. Unless, however, an equatorially-mounted telescope should happen to be used, which can rarely be the case, it is impossible to say, with anything like certainty, where the north point of the moon is. What an explorer, who usually carries a telescope with the ordinary alt-azimuth mounting, requires is some means of finding the angles of immersion and emersion from the *vertex* of the moon, and the following is a simple method of approximately ascertaining these angles.

Upon the diagram showing the circumstances of the occultation already plotted according to Major Grant's method, the positions of the moon's centre, as effected by parallax, at the whole hours selected, and at immersion and emersion, are shown, and the perpendicular lines on the paper represent the celestial meridians, or lines running in a true north and south direction.

In the example here given, let it be supposed that we require to find the approximate angle from the vertex at immersion, which it has been ascertained will take place at $10^h\ 19^m$. The nearest hour to this is, of course, 10^h, for which

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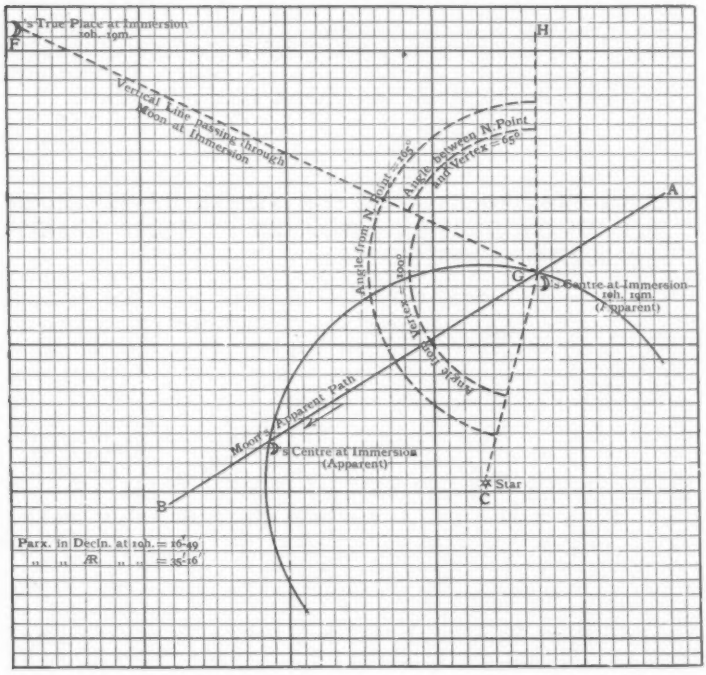
* An appendix to Major S. C. N. Grant's Approximate Method of predicting the Circumstances of an Occultation (*Geog. Jour.*, vol. vii. p. 649).

we have found the parallax in declination to be 16′ 49″, and the parallax in right ascension, 35′ 16″. With these quantities we can turn to the diagram (corresponding with the second in Major Grant's paper) and proceed as follows: Mark off on the diagram the true position of the moon at the time of immersion by means of the parallaxes in declination and right ascension previously found, thus: Taking, as before, each small square on the diagram to represent one minute of arc, mark off the required number (16¾ nearly), counting up from the apparent place of the moon at immersion ($10^h\ 19^m$). (We count *up* in this case, as the true declination of the moon is further north than the prepared or apparent declination; if the opposite had been the case, we should count *down*.) Make a mark at this point,


☽'s True Place at Immersion 10h. 19m.
F
H
Vertical Line passing through Moon at Immersion
Angle between N. Point and Vertex = 65°
Angle from N. Point = 165°
Angle from Vertex = 100°
A
G
☽'s Centre at Immersion 10h. 19m. (Apparent)
Moon's Apparent Path
☽'s Centre at Immersion (Apparent)
Star
B
C
Parx. in Decln. at 10h. = 16′·49
,, ,, R.A. ,, ,, = 35′·16

and then count off to the east or west (left or right) the number of squares and parts of squares equal to the minutes and seconds (in arc) in the parallax in right ascension for the first hour (10^h), also previously computed, and mark this spot clearly. This is shown by F. (When the hour angle is west count off to the left, and when east to the right, of the north-and-south line passing through the moon's apparent place at immersion.) This point, F, will approximately represent the *true* place of the moon at immersion. Next, with a ruler on the point F and the apparent place of the moon at immersion, G, draw a line, FG, connecting these two points. Then FG represents a portion of a great circle passing through the moon's centre and the zenith; and the angle FGC is the angle of immersion, measured from the vertex of the moon.

To find the angle at emersion, all that is required is to go through the same process again, using the parallaxes worked out for the next hour (11^h), and measuring from the moon's apparent place at emersion.

When the parallaxes in declination and right ascension do not vary much between the two hours for which they have been ascertained by Major Grant's method, it will be near enough for practical purposes to use the quantities as they are worked out for the nearest hour without applying any correction for the change during the elapsed interval of time; but when the difference is considerable, a correction should be made, which can be done very readily by applying the proportional part for the elapsed interval, ascertained by means of the change in one hour, which is already given. Then, with these corrected parallaxes, turn to the diagram and proceed as previously described. The resulting angle from the vertex in the present case would, of course, be nearer the truth if this correction had been made; but the difference is only about 2°, which, from a practical point of view, is unimportant.

The angles from the vertex can be found in this way in a few minutes, and, although the results may not be exact, they are quite near enough for the purposes of an explorer, who only wants to know at what part of the moon's disc to direct his telescope.*

The last four lines of the calculation should therefore be altered as follows:—

Star's right ascension	$3^h\ 29^m\ 45^s$	Declination ...	23° 26′ 41″ N.
Moon at 18^h	$3^h\ 29^m\ 28^s$	Declination ...	23° 9′ 14″ N.
Difference in time ...	17^s		
„ „ arc ...	4′ 15″		17′ 27″

A diagram drawn in accordance with the calculation as printed in Major Grant's paper shows that, since the circle drawn from the star as centre, with a radius equal to the moon's semi-diameter, does not cut the line of motion of the moon's centre, no occultation would take place.

THE GEOGRAPHICAL ASSOCIATION.

The Annual Meeting was held in the hall of the Society of Arts, on December 23, Mr. Douglas W. Freshfield, President, in the chair. The *Annual Report* drew attention to the important step taken by the Victoria University in making geography a University subject, by including it in the Preliminary Examination in place of physiography. Reference was made to the appearance of Dr. H. R. Mill's most useful book, 'Hints to Teachers and Students on the Choice of Geographical Books,' a work undertaken at the special request of the Committee. Applications for a *Syllabus* of geographical teaching having been from time to time received, the Committee had, after much consideration, decided to print and circulate for criticism, (1) a general syllabus for Secondary schools; and (2) a scheme of study setting forth the minimum of geographical knowledge that might fairly be required of a boy on leaving the Preparatory school at the age of fourteen. The first experimental copies of coloured *lantern slides*, made by a new process, on which the hon. secretary

* On the diagram at the end of Major Grant's paper, the position of the star, S, has been erroneously plotted, and to bring the calculation in his paper in harmony with the diagram, we must assume the right ascension and declination of the star occulted to be $3^h\ 29^m\ 45^s$ and 23° 26′ 41″ N. respectively.

had been engaged during the past twelve months, had been approved by the Committee, and it was expected that some of the new slides would soon be ready for use. Specimens of the first four maps of the series of *Autograph Hand-maps*, designed to take the place of the unsatisfactory outline and memory maps in common use, were exhibited at the meeting, and it was stated that they would shortly be obtainable from the publisher. Arrangements were being made with Prof. Dodge, of the Teachers' College, New York City, for making his *Journal of School Geography* better known in this country, and for supplying occasional papers and notes of special interest to British teachers. Finally, the Committee had the pleasure of announcing that Mr. Douglas W. Freshfield, late Hon. Secretary of the Royal Geographical Society, had accepted their invitation to become the first President of the Association.

In moving the adoption of the Report, Mr. H. J. Mackinder, Reader in Geography at Oxford, said that it was a record of solid work and progress in a variety of ways, which would compare favourably with the results of any previous year. He was, however, disposed to question the advisability of getting geography recognized in the entrance examinations at the Public schools. To do so might seem to suggest that geography was an elementary subject, which might be laid aside when a boy left the Preparatory school. He also doubted whether it was desirable to issue any general syllabus at all. A bad teacher might wish to have a syllabus prescribed, but the inevitable tendency would be to stereotype teaching and discourage all originality; and the evil would be greater in proportion to the authority with which the syllabus was invested. With this word of warning, he congratulated the Committee on the work they had done, and wished them success in the future. The motion was seconded by Mr. A. C. Bartholomew, Reading, and carried, as was also the adoption of the treasurer's report.

The officers and committee for 1898 having been elected, the Chairman gave a short address, in which he traced the steps taken by the Council of the Royal Geographical Society during the last eleven years to improve the position of geography in the educational system of the country. Their more recent policy had been to teach the teachers, and this had borne fruit in the excellent work done by Mr. Mackinder at Oxford and Reading and in London. The Council was not, however, an educational authority, nor had it much practical acquaintance with the details of teaching. For this reason it ought, he considered, to be glad to see its efforts supplemented by the Geographical Association, which had originated independently among the Public school masters themselves, with aims that were not too ambitious, but thoroughly practical. After mentioning some of the ways in which the Association could do useful work, he spoke of the need for class-books of a literary character—books like Huxley's 'Physiography,' which could be read with pleasure for their style as well as for their substance; and, in conclusion, he acknowledged the support and encouragement which the Association had received from the Royal Geographical Society and the Royal Colonial Institute.

Dr. H. R. Mill, Librarian of the Royal Geographical Society, then gave a lecture on "Some Hints on teaching Geography," illustrated by a great variety of original lantern slides of maps, diagrams, and scenery. Alluding to the remarkable ignorance of geography that prevailed in this country, he said it was not a subject which could be learned merely by reading. Another widespread delusion was the superstitious reverence for the supposed accuracy of geographical facts. But these were not like the facts of mathematics, and teachers should deal with round numbers, as being really representative. Geography had been well defined as "the Science of Distributions," and he threw upon the screen a series of maps specially prepared to illustrate "distributions" of various sorts, from rainfall to religions. Perhaps the most important

hint he could give them was that geography must not be taught by any hard and fast method. In fact, every intelligent teacher might have his own method. Geography touched on so many other sciences, on so many human interests, that any teacher with a hobby or a natural aptitude for any study could find some avenue of approach which would enable him to enter enthusiastically into the subject, and from which as a centre he could teach all that the pupil required to know.

The lecture was followed with keen interest by the representative body of teachers present, and the proceedings closed with a vote of thanks to the chairman and lecturer, proposed by the Rev. J. Ll. Dove, Haileybury, and seconded by Dr. A. V. Markoff.

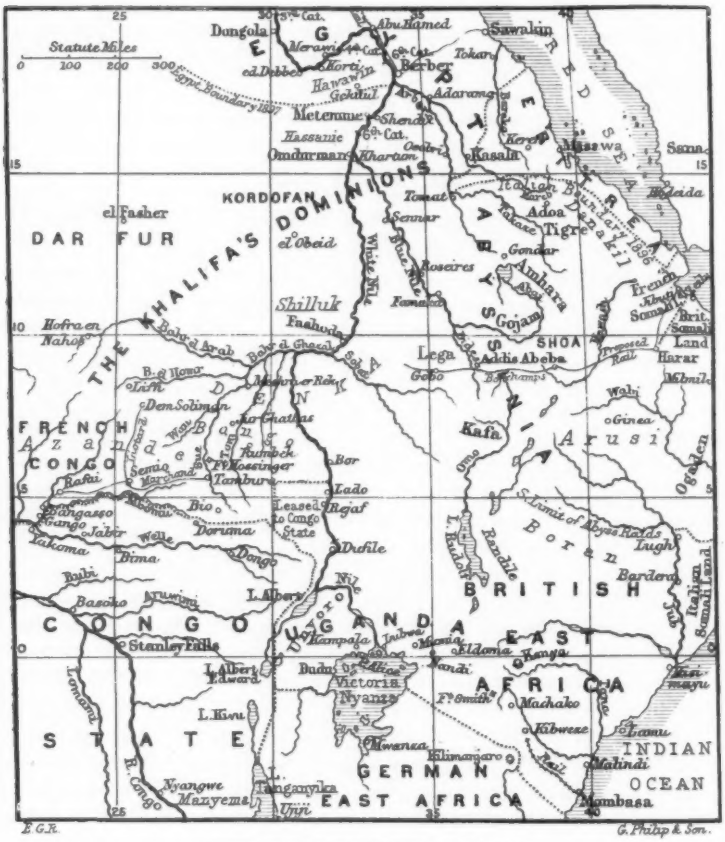
THE UPPER NILE.

So many conflicting reports with respect to the operations of French exploring parties in the valley of the upper Nile have recently been put in circulation, that it is worth while to present a concise statement of what really seems to have happened, as far as can be judged from the scanty information available.

When the French, in 1894, had compelled the authorities of the Congo State to withdraw to the south of the Mbomu river, and to abandon the greater part of the vast territory of which they had secured a lease from the British Government, preparations were set on foot for occupying not only the countries of the Azande, or Nyam-nyam chiefs, within the basin of the Congo, but also to extend French influence beyond the watershed, to the old Egyptian province of Bahr-el-ghazal and the upper Nile. The scheme proposed seems to have been of a most ambitious nature, if the French Press can be looked upon as the exponent of the actual intentions of the French Government. Captain Liotard, who had been appointed commissioner of the Mbomu valley, was to have pushed on to Meshra-er-Rek, where he was to have embarked for Fashoda, an important post on the White Nile held by the forces of the Khalifa, whilst a friendly force of Abyssinians, led by the Marquis de Bonchamps, was to have moved upon the same place from the eastward. Captain Liotard was reported to have occupied Meshra on July 25, whilst the Abyssinian force is stated to have left the Lega country on July 22. This combined advance would thus appear to have been timed most admirably, so far as French interests are concerned.

But months have elapsed since then, and no information whatever has been received in confirmation of these favourable reports. Captain Liotard, starting from Bangasso, made his way up the Mbomu, and claims to have secured the adhesion of the Azande sultans Rafai and Semio. He reached the river Sue (Swe), where he built and garrisoned Fort Hossinger. Supplies failing him, he was compelled to turn back, and in June last occupied Dem Soliman, the old zeriba of Ziber Pasha.

The expedition under Captain Marchand, which was to support this forward movement, arrived at Bangasso in April or May. His force was considerable, for, in addition to twelve Europeans, he had with him several companies of coloured troops. A steam-launch, the *Faidherbe*, was


Statute Miles
0 100 200 300
Egypt. Boundary 1899
Dungola
Abu Hamed
Sawakin
Berber
Metemmeh
Shendy
Khartum
Omdurman
Kasala
Adoa
Tigre
Gondar
Amhara
Gojam
SHOA
Addis Abeba
Lega
Gobo
Kafa
Arussi
Ogaden
Harar
Somali Land
Brit. Somali
Italian Somali
Eritrea
Abyssinia
KORDOFAN
el Fasher
DAR FUR
el Obeid
Shilluk
Fashoda
Roseires
Tomat
Sennar
Blue Nile
White Nile
Bahr el Ghazal
Bahr el Arab
Hofra en Nahas
Meshra er Rek
Lado
Rejaf
Duffile
Bor
Mongalla
Kumbeck
Mossenger
Tambura
Semio
Mayanda
Rafai
Bangasso
Bio
Doruma
Yakoma
Dima
Dongo
Bobi
Basoko
Aruwimi
L. Albert
L. Albert Edward
Stanley Falls
L. Kivu
Tanganyika
Nyangwe
Manyema
Ujiji
Victoria Nyanza
Kampala
Uganda
Mumia
Kavirondo
Kisumu
Eldoma
Kenia
Kenya
Nandi
Machako
Kibwezi
Taveta
Kilimanjaro
Mombasa
Malindi
Lamu
Juba
Somali Land
Boran
Bardera
Lugh
Ogaden
Limit of Moyale Rds
Rudolf
Randile
Omo
Sobat
Nile
Congo
R. Congo
Lualaba
Tanganyika
Luapula
Luvua
Lukuga
Kasai
Sankuru
Lomami
Aruwimi
Welle
Ubangi
Shari
Logone
Benue
Kano
Sokoto
Zaria
Nupe
Ilorin
Lagos
Gulf of Guinea
Bonny
Calabar
Cameroons
Mt. Cameroon
Fernando Po
Gaboon
Ogowe
Loango
Cabinda
Mayumba
Kakongo
Benguela
Mossamedes
Walfisch Bay
Damaraland
Ovampo
Cunene
Angola
Bihe
Bailundu
Mozambique
Zambesi
Shire
Nyassa
Tanganyika
Rhodesia
Matabeleland
Mashonaland
Manica
Sofala
Beira
Chinde
Quelimane
Tete
Zumbo
Kilwa
Lindi
Mikindani
Mozambique
Delagoa Bay
Lourenzo Marques
Inhambane
Sena
Tete
Zumbo
Nyassa
Shire
Zambesi
Kafue
Barotse
Leased to Congo State
Limit of Moyale Rds
Lugh
Bardera
Somali Land
Italian Somali
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Land
Mbmil.
Wabi
Ginea
Ogaden
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Arussi
Boran
Omo
Sobat
Nile

forcibly impressed into the service of the expedition, and received no pay. Notwithstanding these difficulties, Captain Marchand reached the Sue (Swe), in Tambura's country, on August 27. Leaving Captain Germain and Lieut. Dyé in charge of the station, he started himself on a reconnaissance in the direction of Rumbek, whilst Lieut. Mangin was sent down the Sue to Fort Hossinger.

Since then no direct news from the expedition has been received—at all events, none has been made public. We learn, however, that Captain Germain has returned to Bangasso with orders to take up the *Jacques d'Uzès*. Captain Liotard, who came to Semio's on September 11, knew apparently nothing about a disaster, which, according to native rumour, had overtaken Captain Marchand's expedition. A similar rumour reached the Khalifa's camp at Omdurman, and was brought to Europe by Soliman Bey Unger, an Austrian in his service, who was interviewed at Constantinople in October last. The latest report is that the expedition was cut to pieces at Tombo's, and that only one of the officers succeeded in making his escape. Tombo is the name of an Azande sultan, whose son, Ngongo, in Dr. Junker's time, resided at a place in lat. 5° 25′ N., long. 28° 10′ E., about 30 miles to the east of the locality where Captain Marchand is reported to have reached the river Sue.

Our sketch-map shows the localities mentioned in connection with these French expeditions, and their relative positions with reference to other places in the Sudan. Fort Lubwa, where Captain Macdonald is holding at bay the mutinous Sudanese, lies far to the south, on the shores of the Victoria Nyanza. The recent expansion of Egypt on the upper Nile is likewise indicated. Kassala was taken over by Colonel Parsons on December 25, and since then the garrisons of the Khalifa have been expelled. The Egyptians now hold the valley of the Nile as high up as the Atbara, and the whole of the region to the east of that river, including the countries of the Bisharin and Hadendoa. They have pushed to within 200 miles of Khartum.

THE MONTHLY RECORD.

EUROPE.

The Climate of London.—At a recent meeting of the Royal Meteorological Society, Mr. R. C. Mossman, of Edinburgh, read the second of an important series of papers he is preparing on the meteorology of London. This communication refers to the seasonal variations of the phenomena classed as "non-instrumental," and the period under investigation extends from the year 1763 to 1896. A series of frequency curves has been deduced from the long-period averages, and a number of points of interest are brought out. Thunderstorms show a maximum frequency from the beginning of June to the middle of August, and a minimum between

October and March. During January fogs are considerably above the average in number, but they diminish rapidly after the middle of February, falling to a minimum at the beginning of July; a marked increase takes place during September, and the maximum occurs between November 5 and 24. Snow falls most frequently just after New Year, often also in the beginning of March; there is a curious increase in snowstorm frequency about the middle of April—at the time of the "borrowing days" (Old Style), and an equally remarkable decrease at the beginning of December, where there is a mild stormy period of exceedingly regular occurrence. Storms are most frequent at the end of January, and most rare in August. The observations go directly against the belief in increased storm-frequency at the vernal equinox, and a little support given to equinoctial gales in the autumn is more apparent than real, as the equinox marks the beginning of a transition stage from summer to winter conditions.

The Norwegian Fishing-grounds.—We have received from the author, Dr. Johan Hjort, copies of an important paper on the oceanography and biology of the Norwegian fishing-grounds, reprinted from the *Videnskabsselskabets Skrifter*, and also republished in English. The greater part of the paper is devoted to a discussion of the relations existing between such food fishes as herring, cod, and mackerel, to their "prey," now usually known by the general title Plankton, and is therefore not strictly geographical. It is shown, however, that of the two distinct herring-fishing seasons in Norway, the one occurring in spring is due to the herring coming into shallow water to spawn, while the summer fishing is due to their coming inshore in search of food; and the success or failure of these fishings is shown to be directly traceable to the oceanographical, ultimately to the meteorological conditions: at one season the fishing-grounds may be inundated with warm salt water favourable to the fish, at another with cold fresh water, which they avoid by keeping out to sea or remaining at inaccessible depths. Dr. Hjort's work is of great importance as affording further proof of the validity of the methods introduced by the Swedish investigators, and the propriety of extending their application to such comparatively open areas as the "leads" on the western coasts of Norway. Dr. Hjort's observations began in August, 1893, simultaneously with those of the other nationalities concerned in the international survey of the North Sea, and this paper brings him up to February, 1895.* The British observations, begun at the same time, ceased in May, 1894; but there is little doubt that the methods of investigation would apply equally to our own fisheries.

New Austrian Geographical Publication.—We have received the first number of a *Geographischen Jahresbericht über Oesterreich*, which has lately been issued under the auspices of the Austrian Ministry of Education, and editorship of Dr. R. Sieger, of Vienna. The object of the new publication, in the preparation of which Dr. Sieger has been assisted by a number of well-known geographers, is to present a general view, from a strictly geographical standpoint, of the most important works which have appeared during each successive year on Austria or any parts of that country, whether independently or in periodical publications. It is not a mere bibliography, but the notices which are given of the various works enable a clear idea to be gained of the general nature of their contents, especially in the case of those which are not widely accessible. Although naturally the greater number of entries refer to works published in Austria, foreign works are also included. The entries are classified geographically, the first part dealing with general works, the second with those relating to special districts, under the four

* A second shorter paper, published quite recently in *Naturen*, contains observations and discussion for 1896 and the first quarter of 1897.

headings: (1) Alpine provinces; (2) Karst-lands and Adriatic; (3) Sudetian provinces; (4) Karpathian provinces. In the choice of works to be noticed, Dr. Sieger has considered the practical interests of geographers, and the publication should be of much help to all students of the geography of Austria, both in the country itself and abroad. The present issue deals with 1894, but it is hoped in future to diminish the interval between the date of the works reviewed and the appearance of the *Jahresbericht*.

The Population of St. Petersburg.—In the last issue of the *Izvestia* of the Russian Geographical Society (1897, vol. iii.), Prof. I. I. Wilson gives a very interesting review of the results obtained by the last census of St. Petersburg. The immense work of collecting and verifying the census bulletins was done by 2800 persons—of whom only a few were paid in the remotest parts of the town, the remainder being unpaid volunteers, amongst whom were, 497 military officers, 654 civil service officials, 1024 students of the university and the military high schools, and 603 other persons. The number of volunteers was so great that only part of those who offered their services could be accepted. On February 9, 1897, the population of St. Petersburg was 1,267,023, of whom 134,346 were in the suburbs recently annexed to the capital. The growth of population in St. Petersburg was as follows (without the just-mentioned suburbs):—

December 22, 1869	...	...	...	...	...	...	767,963
„ 27, 1881	...	...	...	...	...	...	861,303
„ 27, 1890	...	...	...	...	...	...	954,400
February 9, 1897	...	...	...	...	...	...	1,132,677

The surplus of births above deaths since 1890 having only been 28,000, the growth of St. Petersburg is chiefly due to immigration. The periphery of the town and the suburbs show, of course, the greatest increase. The peasants, who come to the capital for work without ceasing to belong to the peasant class, make 57 per cent. of the population (72 per cent. in the suburbs). The proportion of women is 836 women per each 1000 men in the town, and only 743 in the suburbs.

Dr. Thoroddsen and Icelandic Geography.—The indefatigable explorer and student of Iceland, Dr. T. Thoroddsen, has published in the Icelandic language a history of the geography of Iceland, the first volume of which has been translated into German.* It deals with Icelandic geography down to the close of the sixteenth century. In the course of his scientific study of his native country, Dr. Thoroddsen felt that it would be interesting to examine all that he could discover which had previously been written on the subject. The effort to do so revealed so much of interest to his countrymen, that he resolved to compile a summary for their use which should contain practically everything of scientific or historical value. The first section deals with the question of Thule; the author considers that this name could not apply to Iceland, the discovery of which as an uninhabited land he traces to Irish monks in the eighth century, who were living there when the first of the Northmen arrived. The colonization by the Norsemen and the early civilization of Iceland are then described, with extracts from the Sagas and early writings, giving descriptions of the country. The history of the island since the Reformation occupies half the book. The record of the intercourse between Iceland and

* Th. Thoroddsen, 'Geschichte des Isländischen Geographie.' Autorisierte Uebersetzung von August Gebhardt. Erster Band. Leipzig: Teubner. 1897.

the countries of Europe is full of interest, as showing the competition which existed in the sixteenth century between the fishermen of various nations. Dr. Thoroddsen intends to complete his many years' exploration of his native island next summer, after which he will publish a complete topographical and geological map, as well as a series of memoirs.

ASIA.

The Longitude of Madras.—Our attention has been called to a misstatement of the longitude of Madras which occurs in the article in our last number on the Indian Survey Report for 1895–96. On page 60 the value as recently determined is given as $5^h\ 10^m\ 59{\cdot}113^s$, whereas it should be $5^h\ 20^m\ 59{\cdot}113^s$. The operations by which this result was obtained were briefly described in the *Journal* for 1895 (vol. vi. p. 471), and we have lately received Captain Burrard's full report on the same (Calcutta, 1897). In summarizing the results of the work carried out by himself and Captain Lenox Conyngham, Captain Burrard remarks, "With no limit to time and no limit to expense, with more favourable weather and less frail observers, the recent determination could perhaps be *slightly* improved upon; but if future inventions ever greatly enhance the possible accuracy of scientific surveying, the triangulation of the great trigonometrical survey and the last measurement of the Madras longitude will be rendered obsolete together. The probable error of our final value of longitude, excluding the uncontrollable effects of gravity, is only $0{\cdot}33''$, and with this result no triangulation, however refined, will be able to compete at the end of 7000 miles, until a knowledge has been gained of the size and shape of the Earth, more intimate than at present seems attainable." Captain Burrard gives details (illustrated by a chart) respecting the four other series of observations by which the longitude of Madras had previously been telegraphically determined, carried out in part by American, German, and Russian observers. A comparison of results with those of the recent observations shows a maximum divergence of $0{\cdot}637^s$, whilst the result which agrees most closely, that obtained in 1874 by the route Greenwich, Berlin, Teheran, Karachi, Madras, differs by only $0{\cdot}103^s$.

Cession of Kiao-chau to Germany.—According to the agreement arrived at early in January between Germany and China, the latter leases to the former for a period of ninety-nine years the bay of Kiao-chau, on the south-eastern coast of Shan-tung, together with an area, a few square miles in extent, surrounding the bay. On this ceded territory Germany is at liberty to exercise sovereign rights, and to take all necessary steps for the protection and development of the territory. The limits of the concession appear somewhat vague, and will, no doubt, require demarcation on the spot. It comprises the whole inner basin of Kiao-chau bay up to high-water mark, together with "the larger tongues of land lying south and north of the entrance to the bay to the point where their natural boundaries are marked by suitable eminences, and also the islands situated within and before the bay." Some interesting details respecting Kiao-chau, which was formerly of great importance as a centre of trade, are to be found in Richthofen's 'China' (vol. ii. part 2, chap. vi.), where, in the section dealing with the harbours of Shan-tung, the future as well as the past importance of the place is discussed. The accompanying Atlas (Part i. plates 3, 4, East Shan-tung) may also be consulted with advantage. Useful information respecting Kiao-chau and its *Hinterland* is also given in the report of a lecture by Dr. F. Hirth, published in the *Oesterr. Monatsschrift für den Orient* (1897, No. 12, with map), and in an article in *Aus allen Weltteilen* (xxix. No. 4). The Admiralty Chart (No. 857) gives the results of a careful survey of the bay made in 1863 by H. R. Harris and G. Stanley of H.M.S.

Swallow, and shows the principal features of the immediate neighbourhood, though not extending as far as the city of Kiao-chau. Large-scale maps including the region in question have also been published by A. A. Fauvel ('Province du Shantung.' Paris: Lanée, [1878?]); and by C. Wäber ('North-Eastern China.' St. Petersburg: Ilyin, 1893). Much of the cartography of the province is, however, still derived from Chinese sources.

The Indian Mail.—In connection with the recent decision of the British Government to despatch the Indian mail in the future *viâ* Marseilles, on account of the insufficient harbour accommodation at Brindisi, a short article by Dr. J. Ichenhaüser, in *Aus allen Welttheilen* (xxix. No. 3), written before that decision was made public, is of interest. The writer points out that, though the ideal line for the transit of mails to India—overland from Calais to Bombay—is outside the range of practical politics (in spite of the comparatively short section still wanting to complete the connection), there are two other routes which would be much more feasible—those through Persia and Asia Minor. The first of these would lead by rail *viâ* Berlin to Petrovsk, on the Caspian; thence by steamer to Resht; and across Persia by rail to Bushire, on the Persian gulf, whence Bombay could be reached by steamer in five or six days, the total time required being twelve days. The second would lead through Germany, Austria, the Balkan peninsula, and Anatolia to Basra, and thence on by sea, the total time required being only nine days. As either of these routes, like that connecting Western Europe with the Trans-Siberian railway, would pass through the whole length of Germany, the writer considers it decidedly to the advantage of that country that one or other should be adopted.

Italian Scientific Expedition to Lake Urmia.—The twelfth number of the *Bolletino* of the Italian Geographical Society for 1897 contains a short note on a scientific expedition which started for Lake Urmia under the leadership of Prof. E. Paladini, on September 22 of last year. The principal object of the expedition is the complete study on the spot of the phenomenon of the steady rise of the lake-level, which, as already mentioned in the *Journal* (vol. x. p. 93), has been observed within the last five or six years. Prof. Paladini, who arrived at Tabriz in October last, is well provided with scientific instruments, and hopes both to shed light on the cause of the rise of the water, and also to be able to suggest means for preventing a further rise, if not for restoring the lake to its former level, as a large extent of cultivated land has already been submerged. Prof. Paladini is accompanied by a young engineer named Castaldi, a pupil of his own, and nephew of the Russian consul at Tabriz.

The Okhotsk and Kamchatka Expedition.—The first news from this interesting expedition has been published in the *Izvestia* of the Russian Geographical Society, in the shape of two letters from the leader of the expedition—the geologist, Bogdanovich. The first of these letters was written at the mouth of the Uda, in April, 1896. The expedition reached the port of Nikolaevsk (at the mouth of the Amur) in the autumn, and when the winter had set in they started along the sea-coast to Chumukan, a small port at the mouth of the Uda, which has grown instead of the abandoned Udskoi Ostrog. The journey, 360 miles, took twenty-nine days. It was made in deep snow, which attained a depth of from 4 to 5 feet, the thermometer falling at night to −40° and −50° Fahr. If one may speak of a pole of cold—M. Bogdanovich writes—we may speak also of a "pole of snow," and this region is undoubtedly such for the depth of its snow-covering. Nevertheless, M. Bogdanovich spent more than two months in journeys, on snow-shoes, during the winter. The country is now nearly quite desert, the little nomad population which it had some thirty years ago, when parties of gold-seekers

wandered on the slopes of the Stanovoi range, having moved westwards into the basin of the Amur and the upper Zeya. The aim of all these journeys was to find the means of transport for the expedition on its way further north along the coast, to the seaport of Ayan; and the second letter of K. I. Bogdanovich is dated Ayan, October 27, 1896. The journey was undertaken with but nine miserable reindeer, but when the expedition was in a very critical state it fell in with Tunguses, who aided them in reaching Ayan. The Stanovoi system consists of a series of mountain ranges, the mutual relations of which it is very difficult to disentangle yet. It is only certain that, while the maritime slope of the Stanovoi consists of a series of mountain ranges, the north-eastern slope (towards the Lena) has the characters of an elevated massif, or tableland. Of the ranges parallel to the Jugjur (or Stanovoi) M. Bogdanovich mentions one which runs towards the north-east, between the Uda and its tributary, the Polovinnaya, or Maya river; and another range, Alskiy Khrebet, which also runs south-west to north-east, or north-north-east. About this last range M. Bogdanovich makes the very important remark that it forms the Great Shantar island, and "is undoubtedly a continuation of the Little Khingan" (Dousse-alin, or Bureinskiy Khrebet). The Jugjur and these two ridges consist entirely of crystalline granites, syenites, porphyries, and very few crystalline slates. Stratified deposits — clay slates, quartzites, sandstones, conglomerates, and limestones—appear only in the outer parts of the third ridge, where some lamellibranchiata, belemnites, and ammonites were found. They belong to the Mesozoic age, as well as the stems of trees discovered in quartzites. Gold was discovered in many places in the second range, parallel to the Jugjur. The astronomer of the expedition, N. N. Lelyakin, made six astronomical determinations on the way to Ayan, and at Ayan he observed quite successfully the eclipse of the sun of August 9, 1896.

On the Little Khingan.—M. P. Kropotkin writes: "It is known that before joining the Sungari, the Amur, which flows south-eastwards below Blagovyeshensk, suddenly bends south at Pashkova, and pierces, in a most picturesque valley or broad gorge, a very typical and beautiful range of mountains, the Little Khingan. The great river emerges from it at Ekaterino-Nikolskaya, resumes its eastern course, and enters a wide belt of lowlands, where it joins the Sungari. In these lowlands the Amur and the lower Sungari have, so to say, no determined bed. When the monsoons bring, in July and August, the usual torrential rains, the Amur (and the lower Sungari) inundate all the low mud-islands which exist in their beds, and spread for miles inland, often inundating even the Cossack villages, which have been built on relatively elevated spots. The Little Khingan is thus a marked limit, which separates the fertile elevated plains of the Zeya and the Bureya, thickly clothed with oak and birch bush, from the lowlands of the Amur; these latter stretching in a north-easterly direction along the left bank of the lower Amur, where they are covered with countless flat-shored lakes, acting as water-reservoirs during the rise of the water of the Amur. When I worked out, in 1875, the leading features of Siberia's orography ('Memoirs of the Russian Geographical Society,' vol. v.), and indicated that there is no such range as the Stanovoi khrebet which would run west and east between the tributaries of the Lena on the north and the Amur on the south, and when I consequently traced hypothetically the border ridge of the great plateau in a north-easterly direction, so as to join the Great Khingan with the Jugjur (the range which runs along the coast of the sea of Okhotsk), I found great difficulties in indicating the northern and southern continuations of the Little Khingan. General considerations, my own observations on the Sungari, and Meglitzkiy's observations in the basin of the Uda, induced me finally to include the Little Khingan in one immense range, or rather a series of

short parallel ranges, more than 800 miles long, which I ventured to trace from the gulf of Pecheli to the Shantar islands in the sea of Okhotsk. This range—purely hypothetical then—has since been traced on most maps, since Petermann had accepted my views in his well-known map of Asia in Stieler's Atlas; but it remained a hypothesis. Now it would appear, from Mr. Anert's explorations in Manchuria, which were mentioned in the January number of the *Geographical Journal* (p. 65), that the hypothesis must have been correct as regards the southern continuation of the Little Khingan in Manchuria. On the other side, Mr. Bogdanovich, who is undoubtedly a reliable authority in orography, makes a quite positive statement to the effect that there is no doubt as to the Little Kingan reaching the Great Shantar island. Of course, no definite conclusion can be arrived at until Mr. Anert's and Mr. Bogdanovich's explorations are published in full. But if it be proved that the system of mountain ranges pierced by the Sungari, the Little Khingan, and the Alskiy ridge of Bogdanovich, which makes the Great Shantar island, belong all three to one range—as I suppose they do—we shall have a very important feature of East Asian orography settled; a feature the more important, as that range would be a line of demarcation between the higher fertile plains of the Zeya (1000 feet high or more) and the Merghen-Tsitsikar higher plains of the Nonni-ula on the one side, and on the other side the above-mentioned typical lowlands of the lower Sungari and the Amur, which now offer almost insuperable difficulties to the engineers of the Trans-Siberian railway."

The Bukhtarma Glaciers (Altai).—Glaciers in the Altai mountains were only known on the Byelukha peak. M. Tronoff (*Izvestia* of the Russian Geographical Society, 1897, i.) now describes the glacier he has discovered at the head of the Bukhtarma river. It is about 2 miles long and $1\frac{1}{3}$ mile wide. It has two side moraines, and reaches at its lower end the level of 7900 feet. Lake Bukhtarma, which is usually shown as traversed by the river, is 5 miles from it, on a mountain plateau. Another glacier, smaller than the preceding, was found at the headwaters of the Ukok river, tributary of the Alakh; while at the head of the Alakh, a big glacier, rising from an immense *névé*, was found. It has a length of about $2\frac{1}{2}$ miles, and is 2 miles wide at its head. It ends in a wall about 150 feet high, the river issuing from a tunnel. All the plateau, which is known under the names of Kizen and Ukok, and which has a length of over 30 miles, is entirely covered with morainic deposits (boulders cemented by glacial mud) and small ponds; the glaciers must have covered it entirely, and must have flown down all the valleys much lower than they flow at the present time.

Inundations in Eastern Siberia.—According to a note by M. Obrucheff in the *Geographische Zeitschrift* (1897, p. 709), the past summer was marked by serious inundations in Transbaikalia, which destroyed villages, swept away crops, and did considerable damage to sections of the Trans-Siberian railway. The districts affected were those on either side of the Yablonoi range, watered by tributaries of the Selenga and upper Amur. The flood-water, which found its way to the Selenga, played much havoc in the valley of the latter also. It may be remembered that in the previous year much damage had been done to the railway by unusually heavy inundations in Eastern Manchuria (*Journal*, vol. ix. p. 220).

Explorations in Eastern Siberia and Mongolia.—M. Obrucheff also supplies to the *Geographische Zeitschrift* (1897, p. 710) some information respecting two Russian exploring expeditions in North-East Asia. The first was sent in the summer of 1897 by the East Siberian branch of the Russian Geographical Society to Lake Kosso-gol, in Northern Mongolia, and to the Munku-Sardyk mountains lying to the north of it in Eastern Siberia. The north and east shores of the lake were surveyed, and some soundings taken, whilst scientific observations of various

kinds were made both in the neighbourhood of the lake and of the mountains. A previously unknown glacier was discovered on the northern slopes of the latter, and the glaciation of the group generally was fully studied. The other expedition is a private one, which began its operations last winter in the region between the sources of the Olekma and the Aldan, and is to continue its work during the present winter in the upper valley of the latter river. Since last spring this expedition has been under the leadership of mining engineer Lovitski.

Steam-navigation on the Amu-darya.—According to a note communicated to *Globus* (vol. 73, p. 20) from Tiflis by N. v. Seidlitz, a considerable extension of the distance navigated by the steamers of the Amu-darya flotilla is to ensue early in the present year. Hitherto these steamers have plied between Charjui, where the Trans-Caspian railway crosses the river, and Patta-Hissar, near Masar-i-Sherif, a distance of 250 miles. According to the new arrangement, they will proceed 125 miles further to Faizabad-Kala in 69° E. long., and thus supply a means of communication as far as the borders of Badakshan. Depôts are to be established here for the furtherance of trade. It is also announced that the Turkish Government is meditating the establishment of a service of steamers on Lake Van, an advantage already possessed by Lake Urmia since last year.

Journeys in Korea.—Baron von Grünau, German military *attaché* in Peking, has lately made some extensive journeys in Korea, during which he twice crossed the whole width of the peninsula. According to details given in *Globus* (1897, Nos. 10 and 20), and in *Petermanns Mitteilungen* (1897, No. 12), he appears to have diverged to some extent from the routes of previous travellers, and to have been able to rectify several errors which occur on our maps. On the first journey (made in June of last year), he proceeded along the coast southwards from Wonsan, and then crossed the mountain range which runs near the eastern side of the peninsula, by a very difficult pass not previously crossed by Europeans. From Changan-sa he returned to the mountains, and finally reached Seul after making a considerable circuit to the south-west. He speaks in glowing terms of the grand scenery of the mountainous parts of Korea, which, he says, surpasses anything to be seen in Japan. On the second journey he started from Seul and proceeded north to Pyeng-yang, and thence across to the east coast at Wonsan. Great difficulties were experienced in crossing the numerous unbridged rivers, which in many cases could only be done by swimming. The natives, however, showed themselves very ready to help, and are much praised for their honesty. From Pyeng-yang several old cities were visited. To what extent the route followed thence to the east coast deviated from that used by Mr. Campbell in 1889 in the reverse direction, does not appear.

The Federated Malay States.—The report for 1896, lately made to the High Commissioner by Mr. Swettenham, resident-general of the Federated Malay States, is of special interest, as embracing the first six months of the new *régime*, ushered in by the Federation Treaty of 1895, which took practical effect from July, 1896. The four states under British protection which were parties to the treaty were those of Perak, Selangor, Negri Sembilan, and Pahang, and under the new arrangement these agreed to—(*a*) federation for administrative purposes, with an undertaking to render mutual assistance; (*b*) the appointment of a resident-general as representative of the British Government; and (*c*) the organization of a force of Indian soldiers for service in any part of the Malay peninsula. The new system appears to be working well, and the progress reported as having taken place during the past few years is very satisfactory. European planting, especially the cultivation of Liberian coffee, is said to have made great strides in Negri Sembilan, and the same is reported of mining in Pahang. Irrigation schemes have been set on foot, and much has been done towards opening up new roads, one of which, running

from the terminus of the Selangor railway to Kuala Lipis, the headquarters of Upper Pahang, is 84¾ miles long, and taps some of the most valuable districts of that state. The scenery passed through by it is described as exceedingly fine. Mr. Swettenham urges that attempts should be made to increase the number of cultivated products, and thinks that the rubber industry in particular might be prosecuted with success.

Journey up the Rejang River, Borneo.—A recent number of the *Proceedings* of the American Philosophical Society (vol. xxxv. No. 153) contains a brief report of a journey up the Pejang river in Borneo, by Dr. H. M. Hiller. The river was ascended to a point distant about 300 miles from the sea. The Rejang is the largest river in the north and west side of Borneo. It rises in the unknown mountains called Apoh Byang, and in its course to the sea is greatly obstructed by rapids and cascades. The general direction of the river is from east to west, and, roughly estimating, it is about 270 miles to Belaga, beyond which the distances have not been computed. At Sibu the mile-wide channel breaks into a delta, the mouths of which extend along the coast for 50 miles. Foreign timber ships enter the deep waters of the delta, while trading schooners and vessels of light draught ascend to Sibu and even to Kappit, a distance of 150 miles: beyond the latter place only canoes are possible. Sibu is the second town of importance in the province of Sarawak. Kanowit and Song are unimportant trading stations. Along the banks of the stream Dyaks, Kanowits, Tanjongs, Punans, Kayans, and other tribes have their habitations. The Punans are considered by many travellers to be the aborigines of Borneo. They are hunters, and not farmers, and in this respect differ from almost all the other tribes. They are described as strong, lithe, and active, and lead a nomadic life. To them is attributed the first use of the blow-gun and poisoned arrows. They are the only people in Borneo who practise polyandry. The Ukits are a similar tribe, and can be distinguished by the singular shield-shaped breast tattooing.

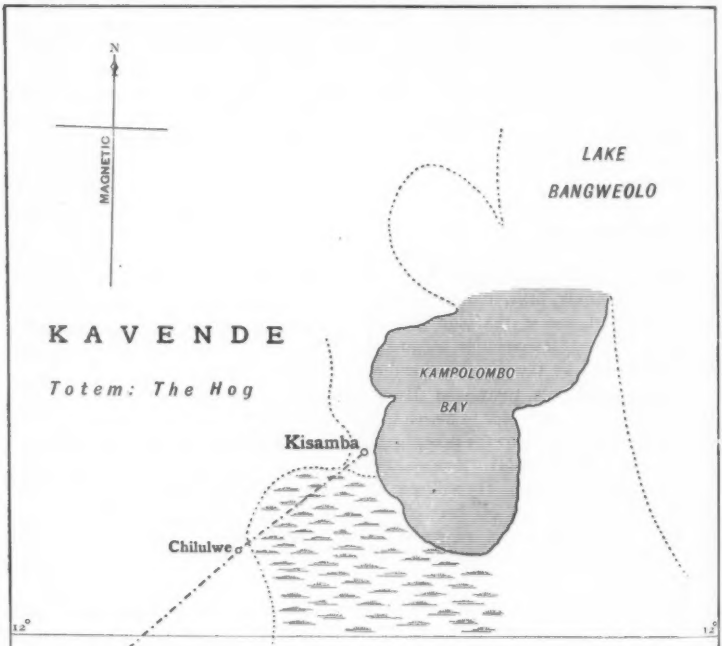
Lieut. Olufsen's proposed New Expedition to Central Asia.—Lieut. Olufsen will leave Denmark in March to undertake a new expedition to the Pamirs, principally with a view to the investigation of the race which inhabits the northern parts of the Wakhan valley. A considerable sum has been assigned for this purpose from the Karlsberg fund. He will also undertake a survey of Lake Yashil-kul, and on his return, which will not take place till the end of 1899, Lieut. Olufson hopes to take photographs of the old ruins in the region south of the Sea of Aral. He will be accompanied by two young scientific specialists; they will winter in Upper Wakhan.

The Principal Branch of the Si-kiang.—In a short communication to the *Comptes Rendus* of the Paris Geographical Society (1897, p. 287), M. Brenier, the leader of the recent Lyonese commercial mission to China, after summarizing the principal geographical results of the various journeys made by himself and his colleagues, makes some remarks on the question of the principal branch of the Si-kiang, or West river. This is usually considered to be the Hong-chu-kiang, which rises not far from Yun-nan-fu, and is certainly the principal branch as far as mere length is concerned. In point of volume of water, however, he considers that the river of Liu-chau-fu, which enters the Hong-chu from the north, a little east of 109° E. long., is decidedly the most important, and offers greater facilities for navigation than the Hong-chu. This fact, he says, was also suspected by Mr. Bourne, who was in the province of Kwei-chau at about the same time as the French expedition. The Liu-chau river rises in the south-eastern, mountainous part of Kwei-chau, where the precipitation is considerable owing to the condensation of the vapours brought by the south-west monsoon. M. Brenier also states that existing

maps are wrong in not showing the Hong-chu as the boundary between Kwei-chau and Kwang-si from the Yun-nan frontier to the point where it makes a sudden bend south. The banks here are not inhabited by aboriginal tribes (Miau-tse, etc.), but by a race allied to the Shans of Indo-China.

AFRICA.

Visit to Lake Bangweolo.—We have received from Mr. D. Crawford, one of the missionaries established for several years past near Lake Mweru, a short account of a visit made by him in July last to the southern parts of Lake Bangweolo, or Bangweulu, as he prefers to spell it. He writes from Kisamba (shown on Giraud's map on the western shore of the southern, swampy portion of the lake), which place he had reached, accompanied by Mrs. Crawford, by following



KAMPOLOMBO BAY—MAP.

the 29th meridian southwards from Lake Mweru through the Ushi country (evidently Giraud's land of the Wa-ussi). He had visited Mere-Mere, the chief who plundered Giraud's caravan, and obtained from him the sections of the boat left behind by that traveller. Although this journey was made at the height of the dry season, Mr. Crawford says that the outlook from Kisamba was over a lovely stretch of blue, *bonâ fide* lake, up which a deep-sea steamer could pass with ease. He complains that recent cartographers have shown an expanse of swamp where Giraud laid down open water, whereas in reality the

swamps were first laid down by Giraud ('Les Lacs de l'Afrique Equatoriale,' p. 220), but have been shown on some subsequent maps as open water. It should be remembered, also, that when Thomson reached the southern shores of Giraud's

KAMPOLOMBO BAY—SKETCH.

region of swamps, the lake (in the dry season) was "neither to be seen nor heard of" (*Journal*, vol i. p. 109). The discrepancy in the accounts is apparently due to variation between different years.

The Subterranean Galleries of the Mitumba Mountains.—Lieut. Léon Cerckel, one of the Belgian officers in the Katanga district, has lately paid a visit to the cave dwellings of the Mitumba mountains, in the south-east Congo basin (*Mouvement Géographique*, 1898, No. 1). Although many travellers, from Livingstone downwards, have spoken of these caves, the principal of them, situated at Mokana, north-east of the Juo falls of the Lufira, had not previously been visited by a European. The passages by which the inner inhabited chambers are reached, traverse a chaotic mass of huge rocks which seem to have been subjected to some great convulsion. The caves, which attain a height of 12 feet or more, are very dark, and the sides are extremely uneven. The various outlets are generally marked by large trees, which are rooted in the actual orifice. Lieut. Cerckel also surveyed the previously unknown portion of the Lufira below the Juo falls. He found that the gorge by which the river traverses the Mitumba mountains becomes deeper and deeper until it attains a depth of about 500 feet, sometimes with precipitous sides. Below, the river is broken by rapids until it enters Lake Kassali. A sketch-map shows Lieut. Cerckel's routes and the results of his surveys.

Railway in German South-West Africa.—We learn from the *Deutsches Kolonialblatt* (1898, p. 5) that a short section of the new railway, starting from Swakopmund for the interior, was opened for traffic on November 20 last. Mr. Cleverly, resident magistrate at Walfish bay, was present at the ceremony. The distance of 6½ miles was performed by a locomotive drawing six carriages with one hundred and forty persons in about half an hour. The rapid strides made by the new port of Swakopmund are said to have much struck the British official.

Dr. Passarge's Travels in South Africa.—In a letter to Baron v. Richthofen, published in the *Verhandlungen* of the Berlin Geographical Society (1897, p. 475), Dr. Passarge gives some additional details (cf. *Journal*, vol. x. p. 212) respecting his investigations in the Lake Ngami region, which are chiefly concerned with the geology of the country. During several journeys towards the south and south-west of the lake, he was able to determine the principal directions of strike of the formations represented. They are two in number. South of Lake Ngami the "Maseganite" strata run in a curved line from west to east-north-east and north-east, and there is also a line of volcanic hills, composed of quartz-porphyry and greenstone, running in a parallel direction. Near Rietfontein, however, on the borders of Damara Land, the strike is from north-north-west to south-south-east, a direction which corresponds with that of the terraced scarp of the Damara

highlands. The Maseganite (quartzite) formation above alluded to occupies a wide area, and is of Palæozoic age. The oldest rocks were found in the south on the Okwa river, and, according to Dr. Passarge, form the "mother rock" of the Maseganite strata. Owing to the absence of horizontal strata of any extent, the country is not favourable for artesian borings, although the recent surface formation of limestone contains water here and there. Proofs of a change of climate in this region are unmistakable, and the whole country is now subject to a rapid process of desiccation and conversion into a sandy waste.

AMERICA.

The Dominion of Canada.—The latest volume of Stanford's 'Compendium of Geography and Travel' is devoted to a description of Canada and Newfoundland,* by Dr. S. E. Dawson. The author has done his work thoroughly, giving a fuller and more satisfactory account of the Dominion than has previously been published. The author treats admirably of the history of Canada and of the several provinces, and shows how the Dominion has acquired its present individuality as a political whole. He gives due prominence to the resources of the country, pointing out how vast the hitherto untouched mineral wealth undoubtedly is; and he draws a truthful picture of the actual condition of the cities and towns of all the provinces from the Atlantic to the Pacific. After a general account of Canada as a whole, each province is dealt with separately in detail. There are several maps which are intended to show the provinces on a fairly large scale, and others on smaller scales for railways, climate, etc. The illustrations are all from recent photographs, and are numerous enough to convey a sound impression of the variety of natural scenery and the advanced state of agriculture, industry, and architecture in the Dominion. The high literary character of the work, and the judicious minimizing of statistics which convey little to a general reader, are points which may be specially commended. Copious references to authorities are given for each chapter, a valuable feature. The general reader can desire no more readable or more trustworthy introduction to the northern part of the American continent, and the fact that the book is written by a loyal British subject and enthusiastic Canadian will not be its least interesting feature.

Crater Lake, Oregon.—The members of the enterprising Mountaineering Club of Portland, known as the "Mazamas," have produced a special and finely illustrated number of their journal, *Mazama*, devoted to Crater lake, one of the most remarkable features of the western plateau of North America. Crater lake lies nearly in 43° N., 122° W., 85 miles by the shortest available route from a station on the Southern Pacific railway. The lake measures 6½ miles in length, and is 4¼ miles wide, its surface stands 6239 feet above sea-level; the water is almost 1000 feet deep in the deepest part; and the whole is surrounded by a precipitous rim of volcanic rock, the lowest point of which is 520 feet above the water surface, and the highest part is almost 2000 feet. The water is remarkably transparent and of an intense blue colour, the brilliance of which has struck all visitors. A small cinder cone near one side of the lake forms Wizard island, the top of which is occupied by a small and very perfect crater. There is, of course, neither outlet nor inlet. The inner slope of the rim, where not precipitous, forms a very steep talus, easy to descend in many places, but exceeding difficult to climb again. The outer slope forms the thickly wooded base of a mountain, which, to judge from the

* Stanford's 'Compendium of Geography and Travel' (New Issue). North America, vol. i.: Canada and Newfoundland, by Samuel Edward Dawson, LITT. D. (LAVAL). Maps and Illustrations. London: Edward Stanford. 1897.

marks of glaciation, was a lofty and active volcano during the Glacial period. The truncation of this mountain—named Mount Mazama by the Portland mountaineers—is ascribed by Mr. J. S. Diller of the U.S. Geological Survey, not to an explosion, but to a collapse into a vast hollow produced by the draining away of molten material through vents on the lower slopes. The whole district has been carefully mapped and scientifically studied by the United States Government, and a photograph is given of a relief model constructed from the contoured map. This model vividly recalls the outline and configuration of some of the lunar craters. There is every prospect of this lonely hilltop chasm becoming a popular resort of tourists, but at the time when the Mazamas visited it, there was neither a stage running to the lake nor any accommodation for travellers when they arrived.

Grenada and Carriacou.—A report on the rocks and soils of Grenada and Carriacou, by Mr. J. B. Harrison, the Government analyst of British Guiana, has recently been issued, and is of interest both geologically and geographically. Mr. Harrison visited the two islands in the beginning of 1895, for the purpose of investigating the character of the soils, typical specimens of which were selected for analysis. Grenada is practically purely volcanic in its origin, the only signs of upheaval being raised limestone beaches towards the extreme north. The chief centres of eruption appear to have been in the neighbourhood of Mount St. Catherine, in that of the Grand Etang, near Mount Sinai, in the neighbourhood of the S.E. mountain, and in what is now St. George's bay. A perfect subsidiary ash crater, probably of later date than the mountain craters, is represented by Lake Antoine. After referring to the different classes of lava occurring on the island, the author treats of the soils examined, which are classified with relation to the parishes from which they were obtained. In referring to the agricultural capabilities of Grenada, he considers that coffee and tobacco may be recommended as subsidiary to the present staples. On the swampy land near the mouths of many of the smaller streams, rice could be profitably raised for local consumption. In his opinion, the future prosperity of Grenada lies in the more scientific treatment of the soil, and especially in the scientific regulation of the process of curing the cacao. The island of Carriacou, so far as examined, appears to consist of layers of volcanic ashes, which were deposited in the sea and afterwards covered with a foraminiferal shallow-water limestone. Later this was subjected to upheaval, with the result that part of the limestone was raised to at least 600 feet above the sea-level. The soils are good and fertile, but, possibly owing to the higher hills having been almost denuded of wood and forest, the rainfall is now so low as to render the cultivation of the majority of tropical crops unsuccessful. The yield of the cotton industry might be greatly increased, while certain districts on the hillside might be planted with logwood. But the only promising industry for this island appears to be the growth of sisal hemp. In the author's opinion, the nature of the soil and climatic conditions are such as to ensure the production of sisal fibre of very high quality.

Results of the Chilian Aisen Expedition.—We have already sketched in outline the work done by the Chilian expedition which last year explored the river Aisen (*Journal*, vol. x. p. 329). Its leader, Dr. Steffen, has since contributed an account of his explorations to the *Verhandlungen* of the Berlin Geographical Society (1897, No. 8–9), at the close of which he summarizes the principal results of the journey, geographical and otherwise. From the former point of view, the principal discovery is that the Aisen, like other recently explored rivers of the Pacific coast of southern South America, has its sources far to the east of the principal chain of the Andes, its basin stretching over the comparatively level country traversed by the Eastern sub-Andine ridges. This fact had been before hinted at by the Chilian Captain Simpson, but without being verified by personal

investigation. It will probably give rise to considerable difficulties in the determination of the Chilian-Argentine boundary in this latitude. The route surveys, triangulation, and hypsometrical observations carried out by the expedition along the two principal branches of the Aisen, extended across the whole of the forest-region of the Cordillera to a point where they may in future be brought into relation with similar work from the east. The tributary streams could, of course, not all be explored, and some uncertainty therefore remains as to the extension of the basin to the north and south. The water-parting, however, seems to run, in the north, between the Aisen and Lakes Fontana and La Plata, bending again to the west in a very pronounced curve, and formed by a line of snowy crests. Towards the south it appears to run at a considerable distance beyond the furthest point reached by the expedition on the southern arm of the Aisen, named by Dr. Steffen and his companions Rio Simpson. On the return march new facts were gleaned with regard to the origin of the main branch of the Palena, and the configuration and settlement of its upper valley, as also with regard to the water-parting between the Argentine Rio Teca and the Corintos valley, drained towards the Pacific. Dr. Steffen considers the valley of the Aisen of considerable importance, both as a line of communication from the coast towards the interior, and a district suitable for the establishment of settlements. There is a small but secure harbour at the mouth of the river.

Journey across Southern South America.—Dr. P. Dusén, the Swedish zoologist attached to the Aisen expedition above described, has, since the termination of that expedition, made a boat journey from Lake Nahuel-Huapi to the Atlantic Ocean, following the course of the Limay and Rio Negro, some details respecting which are to be found in *Petermanns Mitteilungen*, 1897, No. 12, and in the *Verhandlungen* of the Berlin Geographical Society (1897, No. 8–9). The journey was made in company with a settler of German extraction named Karl Wiederhold, a large landowner on Lake Nahuel-Huapi, and one Chilian of the artisan class. As far as the mouth of the Collon Cura the voyage was a dangerous one owing to the rapids, especially that at the mouth of the Traful, but the rest of the journey involved no serious difficulties. The thermometer sank every night below the freezing-point, the lowest temperature recorded being 19°·4 Fahr. Before setting out on this voyage, Dr. Dusén had carried out scientific investigations in the Guaitecas and Chonos archipelagoes, paying special attention to the question of the former glaciation of the islands, as well as to their geology, flora, and fauna.

ARCTIC.

Danish Expedition to Melville Bay.—Mr. Edward Bay, a young man of scientific attainments and independent means, who was a member of Captain Ryder's expedition to the east coast of Greenland, 1891–92, and wintered in Scoresby sound, intends next year to proceed to Melville bay, with a Danish companion and a few Eskimos from the most northerly Danish colonies on the west coast. The party will start from Upernivik with boats, kayaks, and dog-sledges, and winter at a point on the coast of Melville bay for scientific purposes. Mr. Bay and the other young Dane will then the following spring proceed in the direction of Cape York, and then return the same year. Mr. Bay will this year go to Upernivik, and return to Copenhagen in one of the Government vessels, in order to make preparations for the expedition next year.

Danish Expedition to Greenland.—Dr. K. J. V. Steenstrup, the well-known scientific explorer of Greenland, who has spent several years there, will this year, on behalf of "the committee for the geological and geographical exploration of Greenland," of which he is a member, proceed to Disko island to study the glaciers on this interesting spot.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Survey of the North Atlantic.—The Council of the Society have acceded to an application from Mr. H. N. Dickson for assistance in the work of carrying on a physical survey of the surface waters of the North Atlantic during the two complete years of 1896–97, and have made a grant of £100 to him. The general plan of the work was described in Mr. Dickson's paper, published in the *Journal* for March, 1896. In addition to the ordinary temperature observations, extracts of which have been obtained from the Meteorological Office, about thirty volunteer observers have assisted during the two years in collecting samples of surface water, to the number of about four thousand in all. These volunteer observers have included the owners of ocean-going steam-yachts, and the captains of "Atlantic greyhounds," whalers, telegraph steamers, "tramps," trading schooners, and steam-trawlers; and the number could have been greatly increased had funds permitted. Mr. Dickson informs us that the analyses of the samples, which have been made in the chemical laboratory of the University Museum, Oxford, are now nearly completed, and that they show that the samples have been collected and preserved with skill and carefulness by all the observers. The discussion of the immense quantity of material will necessarily occupy some time, but, to judge from the interest excited by the preliminary paper, we may expect important results from the extended inquiry. According to a recent Reuter telegram, the administration of the Lars Hjerta's Minne establishment in Stockholm has made a grant to Prof. Pettersson and his colleagues for a survey of the North Atlantic along the same lines as those followed by Mr. Dickson, but taking in latitudes below his limit (40° N.), and adding biological observations presumably of the kind made by Herdman and Garstang last year. It is, therefore, to be hoped that we are only beginning to take advantage of the services of the large number of willing, skilful observers always to be found amongst those who "use the sea."

GENERAL.

Honours to Dr. John Murray.—Dr. John Murray, F.R.S., has been elected a Foreign Member of the Russian Imperial Academy of Sciences, and the German Emperor, as King of Prussia, has created him a Knight of the Prussian Order *Pour la Mérite.*

Celebration in Honour of Toscanelli and Vespucci at Florence.—A committee has been formed at Florence under the presidency of the Marquis Torrigiani, to organize a celebration at Florence in the coming spring of the fifth centenary of the birth of Toscanelli and the fourth centenary of the principal voyage of Vespucci, which happen exactly to coincide. A circular which has been issued by the committee points out the important share taken by the city of Florence in the promotion of science and discovery, not only through the work of Toscanelli and Vespucci, but as having been in the fifteenth century the chief centre of science, commerce, and exploration in the whole civilized world, thus directly leading the way towards the great discoveries which followed. The celebration is therefore to be regarded, not only as in honour of the two distinguished names coupled with it, but of the city itself, which had, it is claimed, a good right to hand down to posterity the name of one of its sons as the appellation of the New World. The precise form to be taken by the celebration is not yet stated.

Prof. Guido Cora.—Prof. Guido Cora, after filling for sixteen years the professorship of geography to the Royal University of Turin, 1881–1897, has resigned his charge for the purpose of devoting himself solely to researches in the field of

geography and connected sciences. He has transferred his residence (and also the editorship of his periodical *Cosmos*) to Rome (*viâ* Goito, 2).

Two Journeys in Northern Somaliland.—The photographs, from which the illustrations to Mr. Aylmer's paper were taken, were not by Mr. F. Gillett, but by Mr. F. Gunnis.

OBITUARY.

Gardiner Greene Hubbard.

Mr. Gardiner G. Hubbard, President of the National Geographic Society, of Washington, D.C., died at his country house near that city on December 11, 1897. Born at Boston in 1822, and educated there and at Cambridge, Mass., Mr. Hubbard was admitted to the bar in 1843, and attained considerable success as a lawyer during the twenty-five years in which he practised the profession. He was also widely known and respected for his breadth of mind and public spirit, as well as for his varied labours in the interests of his fellow-citizens and the world at large. In particular, his untiring work in the promotion of the teaching of speech to the deaf may be mentioned as leading to the most beneficent results. Although not strictly a scientist, Mr. Hubbard was an enthusiastic supporter of scientific work, and did much to further the practical application of scientific principles: a striking example of this is supplied by his services towards the introduction of the telephone into common use. To geographers he was best known in connection with the National Geographic Society, of which he had been president since its foundation, and to the welfare of which he devoted himself with untiring zeal. He was also a regent of the Smithsonian Institution, and president of the Joint Commission of the Scientific Societies of Washington.

Dr. Eugen Zintgraff.

The death has been announced of Dr. Eugen Zintgraff, well known for his journeys in the interior of the Cameroons in the early days of the German occupation of that territory. Dr. Zintgraff was born in 1858 at Dusseldorf, and was at first destined for the law, but afterwards devoted himself to the study of natural science, obtaining the diploma of doctor at Heidelberg University. He took part in Dr. Chavanne's expedition to the Congo in 1884, and early in 1886 read a paper before the Berlin Geographical Society on the lower Congo region. He soon afterwards proceeded to the Cameroons, of which the interior was then almost absolutely unknown, and showed himself most active in its exploration during a space of over five years. His first attention was devoted to the waterways near the coast, but afterwards he explored the country north of the Cameroons mountains, where he founded the Barombi station as a base for more extended operations early in 1888. The great *desideratum* then was the discovery of a route to the north-east by which the populous Hausa countries, with their enterprising race of traders, could be reached. With the object of effecting such a communication with Adamaua, Dr. Zintgraff set out in December, 1888, from the Barombi station, and, in spite of the strenuous opposition of the Banyang people, succeeded in reaching the grass-covered plateaux which lie behind the coast zone of forests, and making his way across uninhabited wastes to Ibi, on the Benue, and subsequently to Yola, the capital of Adamaua. Dr. Zintgraff described this journey before the Berlin Society in May, 1890, and a report of his paper was published in the R.G.S.

Proceedings for that year (vol. xii. p. 358). He returned to the Cameroons for a couple of years, and subsequently travelled in East and South Africa. The traveller's health suffered severely from his exertions in the cause of geography, and he retired to the island of Teneriffe, where he died in December last. He continued until his death to take much interest in the development of the Cameroons, especially in the direction of the formation of European plantations. He was the author of a book entitled 'Nord-Kamerun, Schilderung der 1886 bis 1892 unternommenen Reisen.'

CORRESPONDENCE.

Maskat.

Lisbon, January 5, 1898.

The inscription of the Fort Maskat, which Captain Arthur W. Stiffe publishes in the *Geographical Journal* of December, naturally not having been taken by an impression, is incorrectly copied and interpreted.

The consequence is, that Captain Stiffe cannot reconcile the date of 1588, clearly indicated in the inscription, with the reference which that gentleman attributes to it, to the eighth year of the reign of King Henry, our cardinal king, whose reign did not last eight years, and who had already been dead for a similar number of years.

Notwithstanding the imperfection of the copy, the Portuguese restitution of the inscription is easy, and evidently the following: "Reinando o mui alto e poderoso Filippe, primeiro deste nome Rei e Senhor nosso, no oitavo anno de seu reinado na Coroa de Portugal, mandou por Dom Duarte de Meneses, seu Viso Rei e Governador da India se fisesse esta fortalesa e a fez Belchior Calaça, seu primeiro capitaõ e fundador, 1588;" and its translation as follows: "Under the reign of the very high and mighty Felippe, first of this name our Lord and King, in the eighth year of his reign in the Crown of Portugal, he sent by Dom Duarte de Meneses, his Viceroy and Governor of India, that this Fortress be made, which was done by Belchior Calaça, its first captain and founder, 1588."

Not only Dom Henry died on January 31, 1580 (and not 1579, as stated by Captain Stiffe), but also Dom Duarte de Meneses was appointed Viceroy and Governor of India, not by that king, but by Felippe II. of Spain, *the first of this name in Portugal*, the crown of which he usurped in 1580. The date indicated corresponds exactly to the eighth year of this reign, and the initial **F** of the name of the king inserted is very clear in the copy, in spite of its imperfection.

Dom Duarte de Meneses left Lisbon to assume his post in India on April 10, 1584, arriving at Cochim on October 26.

Maskat, where the Portuguese had established a kind of co-dominion, more commercial than military, suffered frequent oppressions and depredations by the Arabs and the Mohammedans of India, that is, by the *Arabios* and *Mouros* as they were then called. The Turks, according to Captain Stiffe, when they dared to descend to the sea of Oman, assaulted and destroyed Maskat, and the people of Mogor—the *Mogores* as they were called—advanced through all the "kingdom of Sinde," treating better or worse the Portuguese, who were trading there, according as to whether they were nearer or further from our sovereignty and the resolution shown by them. Besides this, the struggle between the Dutch and English for the dominion of the Persian gulf was already advanced and bitter, and caused our expulsion from the same. The necessity of fortifying Maskat according to our custom or after the European fashion became manifest, as it was an important strategical point for the navigation and trade of Ormuz, and for the route and crossing of the Sea of Oman. The work of fortification had already commenced, advantage naturally being taken of the rudimental native defences. Dom Duarte

de Meneses therefore received instructions and gave orders to consolidate in a more secure manner the occupation of Maskat. He appointed captain for this post Francisco Velho, a man of confidence, who, however, being implicated in a process, was soon afterwards substituted by Belchior Calaça (read *Calassa*, and not Caleça), whom it was that in 1588 was effectively in Maskat as captain. "Who is at present serving," says a royal letter of February 6, 1589, approving the substitution, but recommending that, as soon as Calaça would finish the time of his service and Velho be freed from guilt, the latter should succeed the former. When this letter arrived, the viceroy had already died on May 4, 1588, the same year in which Calaça placed the inscription on the Fort *Capitao*, or Merani, and when, in front of the same, and with it completing the guarding of Maskat, on the sea side, the fort of *Saõ Joao*, or Jaladi, was already erected, having been concluded in the previous year, probably also by Calaça.

The rightful successor to Dom Duarte de Meneses was Mathias de Albuquerque, who succeeded him shortly afterwards, and who, having embarked for Lisbon, left here on May 8, 1590, as viceroy, arriving at Goa in May, 1591.

The fortification of Maskat continued, as did also the development and commercial colonization of this place, as well as the perils and threats which threatened it and all our posts and factories of the Persian gulf.

Another captain, Dom Jeronymo Mascarenhas, commenced a new fort in Maskat, which was continued during the time of the new viceroy, Mathias de Albuquerque, and was recommended in the royal letter of February 5, 1597. Maskat was in a certain manner a conventional dependency of the Government of Ormuz, and the viceroy himself proposed to Lisbon that this dependency should become effective. A royal letter of February 18, 1595, adjourned, however, this resolution, determining that there should be only communication and constant accord between Ormuz and Maskat. Antonio de Sousa Falcao was at this time captain of the latter. The occupation became defined and organized in a military administration. The permanent garrison was fixed at thirty soldiers, who, as Viceroy D. Jeronymo de Asevedo said on November 29, 1613, "rarely became effective on account of the manners and frauds which they were accustomed to practise." By "Alvara" of this date, D. Luiz da Gama, who was then about to govern Ormuz, was ordered, that of the seven hundred soldiers who ought to be at this latter garrison, twenty should be made to reinforce the garrison of Maskat, increasing thereby the latter to fifty, "so long as there should be any fear of its being attacked by enemies from Europe." And in this same decree was announced the project of sending from Goa a further thirty soldiers as well as a captain, apparently for the purpose of the special garrisoning of the last fort constructed.

En passant, and in order that Captain Stiffe may see that our occupation was not so exacting and violent as one might suppose by his sentimental remark regarding the method we employed to secure the respect of the natives, a method absolutely justified by the means, time, and by the circumstances, I would state that still in 1609, and afterwards, we loyally divided the revenue of the custom-house of Maskat with the sheiks, with whom we contracted, or, to be more precise, with their descendants.

It was intended in the above year, and orders were sent from Lisbon, to negotiate with these participators the cession of the share which they had in the fiscal revenue, for a reasonable compensation. But since those persons did not agree to give up their rights, the right, which might have been disputed, was respected, and it was also resolved, in view of the fact that they were interested in the development and fiscalization of the trade, to maintain the traditional *regimen* decreed in the royal letter of January 23, 1612.

Many other interesting things might be indicated which must be reserved for a special work, which will fill up the gap generally found in the histories of Maskat which deal with the period of Portuguese domination. My present intention was simply to offer Captain Stiffe an opportunity of correcting what he states regarding the inscription which is published in his excellent and beautiful articles in any new edition which they may have, as I sincerely hope may be the case.

I will not conclude, however, without observing to the distinguished writer that it is not absolutely exact that in 1650, through the loss of Maskat, the Portuguese were finally expelled from Oman. This expulsion took place some time afterwards. In 1690 our flag was still hoisted in what we called the *Congo* of Persia, at a factory, of which Joaõ da Silva was manager, and Jorge de Freitas secretary; and one of our fleets, commanded by Antonio Machado de Brito, cruised in the Persian gulf, establishing treaties with Bassora, Maskat, etc., and in 1695 we seriously projected the recovery of Ormuz. Persia herself at this time implored our assistance against the Arabs, and offered it against the Imam of Maskat.

If we had not suffered in Europe the ominous union with Spain, surely would have been different the fate to our dominion in the East, which we were the first to open to Christian civilization.

LUCIANO CORDEIRO, Hon. Corr. M.R.G.S.

London, January 15, 1898.

Referring to my paper on Maskat published in the December number of the *Journal* (p. 608), I have received a letter from Mr. Donald Ferguson, a gentleman evidently well acquainted with the language, criticizing the interpretation of the old Portuguese inscription, and suggesting the one given below, which is more probably the correct one, as it reconciles the discrepancy of data which had puzzled me.

I may say the reading I gave was furnished by a Portuguese gentleman, then employed under Mr. F. C. Danvers at the India Office in translating Portuguese records. I cannot ascertain his present address, or I should have referred it back to him.

It will be noted that the king's *name* is not given in full, only the *initial*, which has doubtless led to the difficulty. The letters in brackets are not in the original.

"REINAODO HO MVI A(LTO)E F(IDELISSIMO) HE * PODEROZO F(ELIPPE)(?) † PRIMEIRO(?) DES(S)E NOME R(EI) HE ‡ S(ENHOR) § NOS(S)O NO HOUTAVO AN(N)O DE SEV REINADO NA C(O)ROA DE PORTUGAL MANDOV POR DON DVARTE DE MENEZES SEV VIZOR(EI) DA INDIA Q(U)E SE FIZES(S)E ESTA FORTALEZA A QV(ELL)A FIS(?) ¶ BELCH(I)OR CALAÇA S(E)V PRIMEIRO CAPITAO E FUNDADOR, 1588"

In English—

"Reigning the most high, most faithful, and most mighty, Philip, first of this name, our king and lord, in the eighth year of his reign in the crown of Portugal, commanded by Don Duarte de Menezes, his viceroy of India, that should be made this fortress which (made?) Belchior Calaça, its first captain and founder, 1588."

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* For E. My translator here suggested HENRIQUE.

† For Felippe. My translator amended this F to E for "and."

‡ For E.

§ For Senhor.

¶ This word is obscure.

Of course, this was Philip the *second* of Spain, but first of Portugal, who was proclaimed king of the latter country in 1580 to 1581.

I hope, in view of the interest attaching to the subject, this explanation may not be deemed superfluous.

ARTHUR W. STIFFE.

P.S.—Perhaps I should have used the term "careful copy" instead of "facsimile" in the paper.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1897-98.

Fifth Ordinary Meeting, January 17, 1898.—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

ELECTIONS.—*Charles Henry Akroyd; Thomas Fowell V. Buxton, M.A., J.P., M.C.C.; Noel Edward Buxton, M.A.; Henry Charlwood Carr, Lieut. R.N.R.; G. H. A. Elin; Henry Wilson Fox; W. M. C. Greaves-Bagshawe; William Cecil Harris, M.A.; Ernest Powell King, J.P.; Walter Leaf; F. C. Annesley Lyon, R.N.R., Commander; J. H. Newman; Percy C. Reid; Rev. G. Cullen Reed; William David Wade.*

The Paper read was:—

"Journeys in the East Coast Provinces of Siam." By H. Warington Smyth.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
M. = Mitteilungen.
Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo, quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

EUROPE.

Andorra. *A travers le Monde, Tour du Monde* **3** (1897): 385-388. **Romeu.**

En Andorre: une étrange Coutume judiciaire. Par M. Charles Romeu. *With Illustrations.*

Account of the quaint custom in Andorra of interrogating the corpse of a victim of accidental death.

Austria. **Sieger.**

Geographischer Jahresbericht über Österreich. Mit Unterstützung des hohen k. k. Ministeriums für Cultus und Unterricht . . . Redigiert von Dr. Robert

Sieger. I. Jahrgang 1894. Wien: Ed. Hölzel, 1897. Size 9½ × 6½, pp. xii. and 206. *Presented by the Publisher.*

This important new serial is noticed on p. 172.

Austria—Rain and Rivers. ——

Hydrographischer Dienst in Österreich. Jahrbuch des k. k. hydrographischen Central-Bureaus. III. Jahrgang 1895. Wien: W. Braumüller, 1897. Size 15 × 11. *Maps and Diagrams.*

A splendid record of work, containing a general part with particulars of rainfall and river observations in Austria, lists of stations, etc., and a river-basin map of the Austrian crown-lands, with lines of equal rainfall for 1895. Then follow special parts dealing, by means of tables of actual observations, statistical diagrams and large-scale rainfall maps for 1895, with the Austrian portions of the Danube, the March, Mur, the Drave, the Save, the Adige, the rivers of the coastland, of Dalmatia, the Elbe, the Oder, the Vistula, the Dnieper, Dniester, Sereth, and Pruth. It is unfortunate that this imperial work is not carried on in the same way in Hungary, and the results incorporated in these reports.

Faröe Islands. **Russell-Jeaffreson.**

The Faröe Islands. By J. Russell-Jeaffreson. London: Low & Co., 1898. Size 8 × 5½, pp. xiv. and 272. *Map and Illustrations. Price 7s. 6d. Presented by the Publisher.*

Gives a short history of the islands and the people, and proceeds to describe a tour through the Färoes, with many anecdotes and some local gossip. A map is given on which the author has entered some original information likely to be of use to a visitor.

France—Carcassonne. *A travers le Monde, Tour du Monde* **3** (1897): 393-396. **Gruyer.**

Carcassonne. Par Paul Gruyer. *With Illustrations.*

Carcassonne is one of the most perfect—if not the most perfect—of the walled cities which has retained the features of the middle ages.

France—Loire. *Ann. G.* **6** (1897): 450-455. **Laffitte.**

Les déplacements du confluent de la Loire et de la Vienne. Par M. Louis Laffitte. *With Maps.*

A note will be given on this paper.

Germany—Alsace. **Witte.**

Zur Geschichte des Deutschtums im Elsass und im Vogesengebiet. Von Dr. Hans Witte. . . . Forschungen zur deutschen Landes- und Volkskunde . . . . herausgegeben von Dr. A. Kirchhoff. Zehnter Band. Heft 4. Stuttgart: J. Engelhorn, 1897. Size 9½ × 6½, pp. [126]. *Map.*

After a comparison of Alsace with Lorrain, the author deals with the Germanization of Alsace in ancient times, and with the historical changes in the position of the Franco-German linguistic frontier.

Germany—Dortmund-Ems Canal. *Deutsche Rundschau G.* **20** (1897): 130-131. ——

Der Dortmund-Ems Canal. *With Map.*

The new canal from the heart of the Westphalian manufacturing region to the Ems, thus supplying a direct all-German outlet to the sea, and admitting coal from the Ruhr fields to compete in Hamburg with English coal.

Germany—Harz. *M.V. Erdk. Halle* (1897): 39-54. **Damköhler.**

Bevölkerung des Dorfes Cattenstedt bei Blankenburg am Harz. Von Oberlehrer Ed. Damköhler.

Discusses the statistics of the population of the Duchy of Brunswick for the period 1790-1893 in the case of Cattenstedt, accounting for the manner in which the population has varied.

Germany—Russia. *M.V. Erdk. Halle* (1897): 93-124. **Halbfass.**

Der Arendsee in der Altmark. Von Dr. W. Halbfass. Zweiter Teil. *With Diagrams.*

Germany—Saale. *M.V. Erdk. Halle* (1897): 1-27. **Grössler.**

Urkundliche Nachweise über den Lauf der Saale zwischen Halle und der Wippermündung und die an demselben gelegenen Wüstungen. Von Prof. Dr. H. Grössler. *With Map.*

Germany—Saale. *M.V. Erdk. Halle* (1897): 28-39. **Schroeter.**

Betrachtungen über die Laufveränderungen der Saale zwischen Halle und der Wippermündung bei Bernburg. Von O. Schroeter.

Germany—Thüringia. *M.V. Erdk. Halle* (1897): 92–93. **Reischel.**

Die Wüstung Breitenfurt bei Wenigensömmern. Von Dr. G. Reischel.

Greece.—Aetolia. **Woodhouse.**

Aetolia: its Geography, Topography, and Antiquities. By William J. Woodhouse. Oxford: The Clarendon Press, 1897. Size 10½ × 6½, pp. xvi. and 398. *Maps and Illustrations. Price* 21*s. Presented by the Clarendon Press.*

This will receive further notice.

Holland. *Tijds. K. Ned. Aard. Genoots. Amsterdam* (2) **14** (1897): 492–554. **Lorié.**

De Stormvloed van December 1894 en het vraagstuk der Schelpvisscherij langs onze Kust. Door Dr. J. Lorié. *With Plates.*

On the effect of the storm of December 22, 1894, on the coast of Holland; and the question of the shellfish industry along the coast with reference to the variations in the depth of the water during the last two centuries.

Holland. *J. Manchester G. S.* **13** (1897): 1–46. **Mellor.**

The Cruise of the *Dolphin* in Dutch Waters, 1896. By Mr. E. W. Mellor. *With Map and Illustrations.*

An interesting account of the voyage of a yacht on the waterways of Holland.

Hungary—Waag. *Jahrb. Ungarischen Karpathen-V.* **24** (1897): 1–21. **Siegmeth.**

Topographische Skizzen aus dem Gebiete der Waag. Von Karl Siegmeth.

Description of the valley of the Waag, an impetuous mountain stream of the High Tatra, which forms a tributary of the Danube.

Iceland and Färoe. *Nouv. Archives Miss. Sci. et Littéraires* **7** (1897): 243–327. **Pilet.**

Rapport sur une mission en Islande et aux îles Féroë. Par M. Raymond Pilet. *With Illustrations.*

Popular airs of the folk-songs of Iceland and the Färoes, and many interesting particulars regarding the people and the islands, with illustrations. The music of many songs is given, and the words both in the original and in a French translation.

Italy. **Günther.**

The Phlegræan Fields. By R. T. Günther, M.A. [From the *Geographical Journal* for October and November, 1897.] Size 10 × 6½, pp. 48. *Maps, Sections, and Illustrations.*

Italy—Earthquakes. *Mem. S.G. Italiana* **7** (1897): 81–164. **Baratta.**

Materiali per un catalogo dei fenomeni sismici avvenuti in Italia (1800-1872). Ricerche del socio M. Baratta.

Italy—Lakes. *Riv. G. Italiana* **4** (1897): 514–522. **Marinelli.**

Prima serie di aggiunte e correzioni al Catalogo dei laghi italiani di Olinto Marinelli.

Mediterranean—Cyprus. *J. Anthrop. I.* **27** (1897): 171–177. **Myres.**

Copper and Bronze in Cyprus and South-East Europe. By J. L. Myres, M.A., etc. *With Plate.*

Mediterranean—Malta. *J.R.I. British Architects* **5** (1897): 25–48. **Flower.**

Notes on Renaissance Architecture in Malta, with special reference to the Buildings of the order of St. John. By Arthur S. Flower. *With Plan and Illustrations.*

Mediterranean—Sea of Marmora. ———

Zap. Imp. Russian G.S. **33** (No. 2) (1896): 1–180.

Hydrography of the Sea of Marmora. Expedition, Imperial Russian Geographical Society, 1894. 1. Résumé des recherches hydrologiques. I. Spindler. 2. Selyanikä Expedition in the Sea of Marmora. By N. Andrusoff. 3. Preliminary Report on Biological Researches of the Sea of Marmora. By Dr. A. Ostroumoff. *With Maps and Diagrams.*

Norway—Fæmund Lake Region. **Reusch.**

Forhand. Vidensk.-S. Christiania, 1896 (1897): 1–42.

Geologiske iakttagelser fra strøget i nord for Fæmundsjøen gjorte af forfatteren og andre under reiser for Norges geologiske undersøgelse af Hans Reusch. Med "An English Summary of the Contents." *With Illustrations.*

Norway. *Forhand. Vidensk.-S. Christiania*, 1896 (1897): 1–102. **Reusch.**

Geologiske iakttagelser fra Telemarken, Indre Hardanger, Numedal og Hallingdal gjorte under reiser for Norges geologiske undersøgelse af Hans Reusch. Med "An English Summary of the Contents." *With Illustrations.*

Rumania. *B.S.G. Com. Paris* **19** (1897): 569–589. **Brun.**

La Roumanie actuelle. Les habitants et leurs mœurs, la montagne et la plaine, le Danube et la mer. Par M. Jules Brun.

Rumania. *B.S.G. Română* **18** (1897): 31–108. **Țițu.**

Geografia comunei Comîndărești din plasa Jijia-Ștefănești, districtul Botoșani, cu notițe istorice și tradiționale de I. Țițu.

Description of the province of Comîndarest.

Russia—Kherson. *Mem. Comité Geologique, Russe* **14** (1896): No. 2. **Sokoloff.**

Hydro-geological investigations in the Government of Kherson, by Dr. N. Sokoloff, with an appendix by W. Toporoff on Water analyses, and a geological map. [In Russian, with detailed *résumé* in German.]

Russia—Lake Onega. *B.S.G. Italiana* **10** (1897): 450–456. **Marinelli.**

Dati morfometrici sul Lago di Onega, nota del socio Prof. Olinto Marinelli.

Description of the depths of Lake Onega, with a hypsometric curve.

Russia—Murman Coast. *Iz. Imp. Russian G.S.* **33** (1897): 67–80. **Rippas.**

The Change of the Water-level in the relict-lake Mogilnoe, on Kildin island. By B. A. Rippas. *Tables and Diagrams.* [In Russian.]

Russia—Poltawa. *Globus* **72** (1897): 315–320. **Krause.**

Vegetationsskizze des russischen Gouvernements Poltawa. Von Ernest H. L. Krause.

Russia—Tsylma. *Iz. Imp. Russian G.S.* **33** (1897): 53–66. **Barteniyeff.**

On the Copper Ore of the river Tsylma (N. Russia). By I. P. Barteniyeff. *Map.* [In Russian.]

Servia. **Vivian.**

Servia, the Poor Man's Paradise. By Herbert Vivian, M.A. London: Longmans & Co., 1897. Size 9 × 6, pp. lvi. and 309. *Portrait and Map. Price* 15*s*. *Presented by the Publishers.*

The author states that "nothing serious has been written about Servia for some thirty years," presumably meaning no English book. The book treats in an enthusiastic manner of this little-known country, giving an account—parts of which have been published in weekly newspapers—of the life of the people in their political, social, economic, and intellectual relationships, with one chapter devoted to "Beautiful Belgrade," and another to "Towns and Country." A map of Servia on the scale of about 1 : 500,000 is given.

Sweden—Mining Industries. *J.S. Arts* **46** (1897): 61–78. **Brough.**

The Mining and Metallurgical Industries of Sweden, as shown at the Stockholm Exhibition. By Bennett H. Brough. *With Plan and Illustrations.*

Sweden—Öland. **Hemmendorff.**

Om Ölands vegetation. Akademisk Afhandling af Ernst Hemmendorff. Upsala, 1897. Size 9 × 6½, pp. viii. and 82. *Sketch-map. Presented by the University of Upsala.*

On the vegetation of Öland.

Turkey—Albania. *Mem. S.G. Italiana* **7** (1897): 15–44. **Baldacci.**

Itinerari albanesi del socio dott. Antonio Baldacci. *With Map.*

Travels in the west of Albania from Ballona as a centre.

United Kingdom—England—Dorset. **Eaton.**

Returns of Rainfall, &c., in Dorset in 1896. By Henry Storks Eaton, M.A. [From *Proceedings* Dorset Natural History and Antiquarian Field Club, vol. xviii., 1897.] Dorchester, 1897. Size 8½ × 5½, pp. 12.

United Kingdom—England—Devon. **Peek.**

Rousdon Observatory, Devon. Volume viii. Meteorological Observations for the Year 1896, made under the superintendence of Cuthbert E. Peek, M.A., London, 1897. Size 11 × 9, pp. 36. *Frontispiece.*

United Kingdom—England—Devon. *Nature* **57** (1897): 209–210. **Wheeler.**

The Northam Pebble Ridge. By W. H. Wheeler.

United Kingdom—England—Dorset. **Eaton.**

Dorset Monthly Rainfall, 1856-95. By Henry Storks Eaton, M.A. [From *Proceedings* Dorset Natural History and Antiquarian Club, vol. xviii., 1897.] Dorchester, 1897. Size 8½ × 5½, pp. 16. *Presented by the Author.*

A detailed record for each month since 1856 of the average rainfall in Dorset, with supplementary tables discussing the data. The total mean annual rainfall of Dorset for 1856-95 was 34·02 inches, compared with 24·22 inches for Greenwich. May was the driest month in Dorset (2·01 inches), and October the wettest (4·06 inches).

United Kingdom—Great Britain.

The Rivers of Great Britain, Descriptive, Historical, Pictorial. Rivers of the South and West Coasts. London: Cassell & Co., 1897. Size 18 × 10, pp. viii. and 376. *Illustrations. Price* 42*s. Presented by the Publishers.*

This beautifully illustrated volume is the work of many competent hands, who by their literary and artistic skill have done justice to their theme. The Southern Chalk Streams are described by Mr. W. Senior, the Rivers of Devon by Mr. W. W. Hutchings, those of Cornwall by Mr. H. W. Strong, the Severn in three chapters by Prof. Bonney, the Wye and the Usk by Mr. E. W. Sabel, the Rivers of South Wales by Mr. C. Edwardes, those of North Wales by Mr. A. Watson, the Mersey by Mr. W. S. Cameron, the Rivers of Lancashire and Lakeland by Mr. W. Senior, those of the Solway Firth by Mr. F. Watt, the Rivers of Ayrshire and the Clyde by Mr. John Geddie. The standpoint of the writers is not, as a rule, that of the modern geographer.

United Kingdom—Ireland. *J. Anthrop. I.* **27** (1897): 164–170. **Beddoe.**

On Complexional Differences between the Irish with Indigenous and Exotic Surnames respectively. By John Beddoe, M.D., etc.

United Kingdom—Scotland. *Z. Ges. Erdk. Berlin* **32** (1897): 146-191. **Penck.**

Geomorphologische Probleme aus Nordwest-Schottland. Von Albrecht Penck. *With Plate.*

This is a detailed description of the observations made by Prof. Penck in his excursion to the north-west of Scotland after the Geographical Congress in 1895. It is referred to in this number of the *Journal*, p. 163.

United Kingdom—Speleology. **Martel.**

British Caves and Speleology. By E. A Martel. [From the *Geographical Journal* for November, 1897.] Size 10 × 6½, pp. 12. *Illustrations.*

ASIA.

Arabia. *Oesterreichische Monatschr. Orient* **23** (1897): 126–128. **Glaser.**

Der Damm von Mârib. Von Eduard Glaser.

On the ancient dam of Marib mentioned in the Koran, and on the discovery of its remains

Asia Minor. *Mouvement G.* **14** (1897): 373-376. **Bastelica.**

En Asie Mineure, Le chemin de fer de Smyrne à Cassaba et prolongement. Par J. B. M. Bastelica. *With Map.*

Asia Minor. *Nouv. Archives Miss. Sci. et Littéraires* **7** (1897): 329-365. **Chantre.**

Rapport sur une mission scientifique en Asie Mineure, spécialement en Cappadoce (1893–1894). Par M. Ernest Chantre. *With Illustrations.*

Asia Minor—Cappadocia. *Mém. S.G. Genève* **36** (1897): 75–113. **Boissier.**

En Cappadoce. Par M. Alfred Boissier. *With Plates.*

A journey made in 1894 with M. and Mme. Chantre.

Asia Minor—Zonguldak *Ann. Hydrographie* **25** (1897): 426–427. **Schmaltz.**

Der Kohlenhafen von Zonguldak im Schwarzen Meer, Vilajet Kastamouni, Kleinasien (Concessionirt der "Société Héraclée"). Von Kapt. W. Schmaltz. *With Plan and Illustration.*

Asiatic Turkey *Rev. G.* **41** (1897): 451–466. **Zélénoï and Sissoév.**

Notice explicative de la Carte de la répartition de la population arménienne dans l'Arménie turque et dans le Kurdistan, d'après les renseignements et données do l'ouvrage la *Turquie d'Asie*, par V. Cuinet (1890–94), par MM. Zélénoï et Sissoév. Traduit du russe par M. Soevil.

Central Asia. **Hedin.**

General Prschevalskij's Forskningsresor i Central-Asien. Efter de ryska, tyska och franska original-upplagorna af Sven Hedin. Förord af Prof. A. E. Norden-

skiöld. Stockholm: A. Bonniers Förlag, [1891]. Size 9 × 6, pp. 456. *Portrait, Maps, and Illustrations. Presented by the Author.*

Dr. Sven Hedin here presents a translation into Swedish from the Russian, German, and French originals of General Prjevalsky's travels.

China and the Pamirs. *Contemporary Rev.* **72** (1897): 867–879. **Parker.**

China and the Pamirs. By E. H. Parker. *With Map.*

A history of the relation of the Chinese to the Pamir region and Central Asia, from the earliest times to the present.

China—Mongolia. **Franke.**

A travers le Monde, Tour du Monde **3** (1897): 321–323, 337–340.

De Pékin à la Frontière Russe. A travers la Mongolie et la Mandchourie. Par M. le Dr. Franke. *With Illustrations.*

China—Mongolia. **Malleson.**

Protocol Troitskosadsk-Kyakhta Br., Amur Sect. Imp. Russian G. S., No. 7 (1895): 3–23.

Excursion to Mongolia, along the watershed of the rivers Iro and Chikoi, summer, 1895. V. Malleson. [In Russian.]

China—Mongolia. **Shatin.**

Protocol Troitskosadsk-Kyakhta Br., Amur Sect. Imp. Russian G. S., No. 7 (1895): 25–32.

The Khunchir (Glycorhiza) Root Industry in Mongolia. N. Shatin. [In Russian.]

Dutch East Indies. **Timmerman.**

Kaartbeschrijving. Door J. Æ. C. A. Timmerman. *Overgedrukt uit de Encyclopædie, voor Nederlandsch-Indië, deel II.* Size 11 × 7½, pp. [28]. *Presented by the Author.*

A history of the cartography of the Dutch East Indies, including an account of the various surveys and lists of the published atlases and maps.

India—Assam. **Monahan.**

Annual Note on Crop Experiments in Assam for 1896-97. By F. J. Monahan. Calcutta, 1897. Size 13½ × 8½, pp. 16.

India—Burma. *Deutsche Rundschau G.* **20** (1897): 116–122. **Dürr.**

Die Karenen. Von Ludwig Dürr. *With Illustrations.*

India—Madras. **Burrard.**

Report on the Recent Determination of the Longitude of Madras. By Captain S. G. Burrard, R.E. Under the direction of Lieut.-Colonel St. G. C. Gore, R.E. Calcutta, 1897. Size 13½ × 8½, pp 26. *Charts.*

This is specially referred to on p. 174.

India—Marine Survey. ———

Administration Report of the Marine Survey of India for the Official Year 1896-97. Bombay, 1897. Size 13 × 8½, pp. 8. *Presented by the Survey.*

India—Tinnevelly. *Mission Field* **42** (1897): 386-394, 422–429, 454–469. **Margöschis.**

Tinnevelly: being an account of the District, the People, and the Missions. By Rev. A. Margöschis. *With Map and Illustrations.*

Japan. *J. Tōkyō G. S.* **9** (1897): 345–352. **Suzuki.**

Topography of the Environs of Hamada in Iwami. By T. Suzuki. [In Japanese.]

Japan—Formosa. **Honda.**

M. Deutsch. Ges. Natur- u. Völkerk. Ostasiens Tokio (1897): 469–473.

Eine Besteigung des Mount Morrison auf der Insel Formosa. Von Dr. Seiroku Honda.

A note on this ascent appeared in the *Journal* for January, p. 68.

Japan—Formosa. *J. Tōkyō G.S.* **9** (1897): 352–359. **Torii.**

The Aborigines in the Northern Part of Formosa. By T. Torii. [In Japanese.]

Malay Archipelago—Borneo. *P. American Philosoph. S.* **35** (1896): 321–328. **Hiller.**

A Brief Report of a Journey up the Rejang River in Borneo. By H. M. Hiller, M.D.

This journey is referred to in the Monthly Record, p. 179.

Malay Archipelago—Borneo. *P. American Philosoph. S.* **35** (1896): 309–320. **Furness.**

Glimpses of Borneo. By William Henry Furness.

This paper contains a detailed account of the life in a Kayan long-house in Sarawak.

Malay Archipelago—Sumatra. **Karácson and Fennema.**

Tijds. K. Ned. Aard. Genoots. Amsterdam (2) **14** (1897): 555–570.

De Vulkaan Kaba op Sumatra. Door A. A. von Karácson (met eene inleiding door R. Fennema en Kaarten No. III. en IV.).

The volcano is shown by a contoured map on the scale of 1 : 5000.

Persia. **Hedin.**

Konung Oscars Beskickning till Schahen af Persien år 1890. Skildrad af Sven Hedin. Stockholm: Samson & Wallin [1891]. Size 9½ × 6½, pp. xvi. and 480. *Portrait and Illustrations. Presented by the Author.*

A finely illustrated record of a journey to Persia *viâ* Constantinople and Tiflis, and of a short residence in Teheran.

Persia, etc. **Hedin.**

Genom Persien, Mesopotamien och Kaukasien. Reseminnen af Sven Hedin. Förord af professor Hermann Vámbéry. Stockholm: A. Bonniers Förlag [1887]. Size 9 × 6, pp. xvi. and 464. *Maps and Illustrations. Presented by the Author.*

Describes a journey through the trans-Caucasian district to Persia, various journeys through that country and in Mesopotamia, and a return through Turkey and Bulgaria.

Persia and Central Asia. **Hedin.**

Genom Khorasan och Turkestan. Minnen från en Resa i Centralasien 1890 och 1891. Af Sven Hedin. 2 vols. Stockholm: Samson & Wallin, [1892]. Size 10 × 6½, pp. 532. *Map and Illustrations. Presented by the Author.*

Illustrated description of a journey in Eastern Persia, with a visit to the Russian trans-Caspian provinces and Bokhara, and a farther journey eastwards to Kashgar. The illustrations include a number of clever sketches by the author, many of them typical portraits of Central Asian types.

Russia—Caucasus. **Dmitriyeff.**

Material Topog. Ethnolog. Caucasus **22** (1897): pt. 2, 163–187.

Economic state and customs of the inhabitants of Free-Svanetia, Government of Kutais. By N. Dmitriyeff. [In Russian.]

Russia—Caucasus. *B.S.G. Marseille* **21** (1897): 150–162. **Fournier.**

Voyage au Caucase. Par M. E Fournier.

A journey in the spring of 1895.

Russia—Caucasus. *Zemlevedenie* **4** (1897): 59–100. **Ivanovsky.**

Mount Ararat. By Al. Ivanovsky. *Illustrations.* [In Russian.]

Russia—Caucasus. **Lominadze.**

Material Topog. Ethnolog. Caucasus **22** (1897): pt. 2, 188–209.

Journey in the Rion defile. By Sh. Lominadze. [In Russian.]

Russia—Caucasus. **Machavariani.**

Material Topog. Ethnolog. Caucasus **22** (1897): pt. 2, 1–53.

Descriptive and historical sketch of the city of Artvin. By K. Machavariani. *Illustrations.* [In Russian.]

Russia—Caucasus. *Zemlevedenie* **4** (1897): 49–58. **Podozersky.**

Imeritia. By Podozersky. [In Russian.]

Russia—Central Caucasus. *Alpine J.* **18** (1897): 487–498. **Holder.**

Climbs among the Peaks of the Adyrsu, Central Caucasus. By H. W. Holder.

Russia—Siberia. *Aus allen Weltteilen* **29** (1897): 95–102. **Berghaus.**

Der jetzige Stand der transsibirischen Bahn. Von Major a. D. Berghaus.

Russia—Siberia. *Iz. E. Sib. Sect. Imp. Russian G.S.* **28** (1897): 82–85. **Bogolyulesky.**

Notice on Lake Baunt and its Hot Springs in Bergusinsk district, Trans-Baikalia. By I. S. Bogolyuleski. [In Russian. *Résumé* in German.]

Russia—Siberia. *Iz. E. Sib. Sect. Imp. Russian G.S.* **28** (1897): 25–43. **Bogoslovsky.**

The river Selenga in Trans-Baikalia and its navigation, with a map of its delta. By A. Bogoslavsky. [In Russian.]

The author describes the course of the Selenga, with reference to the variation in its water-level and velocity, shoals and rapids, and, by the aid of a rough sketch-map, the chief channels of the delta which admit vessels to Lake Baikal. A table of the dates of opening and closing of the river by ice from 1846 to 1893 is also given.

Russia—Siberia. *Zemlevedenie* **4** (1897): 1–28. **Ignatoff.**

On the Southern Altai Mountains. By P. Ignatoff. *Illustrations.* [In Russian.]

Russia—Siberia. **Jefferson.**

Roughing it in Siberia, with some account of the Trans-Siberian Railway, and the Gold-mining Industry of Asiatic Russia. By Robert L. Jefferson. London: Low & Co., 1897. Size 7½ × 5, pp. 252. *Map and Illustrations. Price 6s. Presented by the Author.*

A popular account of a winter journey in Western Siberia, which the author appears to have found very uncomfortable. He travelled by the new Siberian railway to Krasnoyarsk, and thence by sledge to the gold-mines in the Sayan mountains.

Russia—Siberia. *Iz. E. Sib. Sect. Imp. Russian G.S.* **28** (1897): 44–81. **Levin.**

Fishing Industry of Olkhon Island (Lake Baikal). By N. V. Levin. [In Russian. *Résumé* in German.]

Russia—Siberia. *Iz. E. Sib. Sect. Imp. Russian G.S.* **28** (1897): 1–24. **Obrucheff.**

Excursion to the Gold-bearing District of the Rivers Sarma and Ilikta, in the Western Baikal Mountains. By V. A. Obrucheff. *Map.* [In Russian. *Résumé* in German.]

Russia—Siberia. *Petermanns M.* **43** (1897): 267–270. **Thiess.**

Das Gouvernement Jakutsk in Ostsibirien. (Nach den Angaben der Sitzungsberichte der Kaiserl. Russ. Geogr. Gesellschaft und des Statistischen Komitees in St. Petersburg. Mitgeteilt von Ingenieur F. Thiess.)

Russia—Siberia. **Vilkitzky and Ivanoff.**

Hydrog. Notices, St. Petersburg **18** (1897): 92–96.

Telegraphic Determination of the Difference of Longitudes of Yeniseisk and Krasnoyarsk. By Colonel A. Vitkovsky and Lieut. N. Ivanoff. [In Russian.]

AFRICA.

Abyssinia. *C. Rd. S.G. Paris* (1897): 313–319. ———

Voyage du prince H. d'Orléans et de MM. de Poncins et Mourrichon d'Addis Abbaba à Djibouti. *With Map.*

Africa—Historical. **Coudray la Blanchère.**

Nouv. Archives Miss. Sci. et Littéraires **7** (1897): 1–109.

L'aménagement de l'eau et l'installation rurale dans l'Afrique ancienne. Par M. du Coudray la Blanchère.—Rapport sur les recherches pour suivre pour déterminer le mode et les conditions de la colonisation et de l'exploitation jusqu'à l'arrivée des Arabes. *Maps and Sections.*

This Report deals with the methods of artificial water-supply and irrigation adopted in North Africa, west of Egypt, in the period anterior to the Arab invasion.

Algeria. *Rev. Scientifique* **8** (1897): 587–591. **Zaborowski.**

L'assimilation des indigènes de l'Algérie. Par M. Zaborowski.

British West Africa—Benin. *Globus* **72** (1897): 309–314. **Carlsen.**

Benin in Guinea und seine rätselhaften Bronzen. Von Dr. F. Carlsen. *With Illustrations.*

British West Africa—Gold Coast. *J.R. Colonial I.* **29** (1897): 36–40. **Richards.**

The Gold Coast Colony. By T. H. Hatton Richards. [Abstract.]

Canary Islands—Anaga. *Scottish G. Mag.* **13** (1897): 617–624. **Ossuna.**

Anaga and its Antiquities. By Don Manuel de Ossuna y Van Den-Heede. Translated by Miss M. W. Macdowall.

Canary Islands—Ethnology. *J. of T. Victoria I. (London)* **29** (1897): 239–262. **Dawson.**

On Specimens in the Peter Redpath Museum of McGill University, illustrating the Physical Characters and Affinities of the Guanches or Extinct People of the Canary Islands. By Sir J. William Dawson. *With Plates.*

Central Africa. *Mouvement G.* **14** (1897): 313–315. ———

La région des grands lacs. *With Map.*

Congo Basin *Mouvement G.* **14** (1897): 397, 421, 433, 471, 505. **Cornet.**

La géologie du bassin du Congo d'après les connaissances actuelles. Par J. Cornet.

Congo State. *Mouvement G.* **14** (1897): 557–559, 565–567. **Wauters.**
Comment le Congo traverse la chaîne des monts de Cristal. Description du cours du fleuve entre Tshumbiri et Boma. Les bas-fonds de l'ancienne mer centrale du haut bassin congolien. Par A. J. Wauters. *With Map.*

East Africa. *M. Deutsch. Schutzgeb.* **10** (1897): 182–189. **Stuhlmann.**
Bericht über das deutsch-portugiesische Grenzgebiet am Rovuma. Von Dr. F. Stuhlmann.
Bemerkungen zur Karte des deutsch-portugiesischen Grenzgebietes an der Rovumamündung. *With Map.*
This is noticed in the *Journal* for December, vol. x. p. 637.

Egypt. *Ann. G.* **6** (1897): 456–460. **Brunhes.**
Les irrigations en Égypte. Par M. J. Brunhes.
A historical sketch of Egyptian irrigations from the time of the Pharaohs to the present.

Egypt—Ancient People. *B.S. Khédiv. G.* **4** (1897): 785–805. **Schweinfurth.**
De l'origine des Égyptiens et sur quelques-uns de leurs usages remontant à l'âge de la pierre. Par G. Schweinfurth.

Egypt—Nile Cataracts. *P.R. Artillery I.* **24** (1897): 511–524. **Butler.**
The Nile Cataracts. By Major-General Sir W. Butler, K.C.B.
Contains reminiscences of the Nile boat expedition of 1884–85.

German East Africa. *M. Deutsch. Schutzgeb.* **10** (1897): 206–222. **Berg.**
Das Bezirksamt Mikindani. Bericht des Bezirksamtmanns Berg.

German East Africa. **Fitzner.**
Aus allen Welttheilen **28** (1897): 735–746, 767–778, 817–824.
Die Pflanzungen in Deutsch-Ostafrika. Von Rudolf Fitzner.

German East Africa. *M. Deutsch. Schutzgeb.* **10** (1897): 234. **Kiepert.**
Begleitworte zur Karte 4. Von R. Kiepert. Neue Aufnahme von Pater Capus und Lieut. v. Wulffen in Unyamwesi.
The map is on the scale of 1 : 300,000.

German East Africa. *M. Deutsch. Schutzgeb.* **10** (1897): 169–176. **Stadlbaur.**
Turu. Von Lieut. Stadlbaur.

German East Africa. *Petermanns M.* **43** (1897): **289.** **Triloff.**
Die Schambalai oder West-Usambara, nach einer Skizzenkarte des Missionars Lang-Heinrich zu Wuga und verschiedenen gedruckten und ungedruckten Quellen, im Massstab 1 : 125,000. Bearbeitet von P. Hermann Triloff. *With Map.*
The map is on the scale of 1 : 200,000.

German South-West Africa. *Globus* **72** (1897): 297–299. **Gessert.**
Der Seewind Deutsch-Südwestafrikas und seine Folgen. Von Ferdinand Gessert.
Study of the sea-breeze on the coast.

German South-West Africa. *Deutsche Kolonialzeitung* **10** (1897): 512–514. **Rehbock.**
Deutsch Südwestafrika. Von Regierungsbaumeister Rehbock. *With Map.*

German West Africa—Kamerun. *M. Deutsch. Schutzgeb.* **10** (1897): 155–164. **Stein.**
Ueber den Ossa- (Lungasi-) See, Kamerungebiet. Von Premierlieutenant Freiherrn v. Stein. *With Map.*
This is noticed in the *Journal* for December, vol. x. p. 638.

German West Africa—Togo. *Globus* **72** (1897): 301–304. **Förster.**
Das deutsch-französische Grenzabkommen in Togo. Von Brix Förster. *With Map.*

German West Africa—Togo. **Gruner and Zech.**
M. Deutsch. Schutzgeb. **10** (1897): 143–154.
Die astronomischen Beobachtungen Dr. Gruners auf der Reise im Togohinterlande in den Jahren 1894 und 1895.
Astronomische Ortsbestimmungen von Graf Zech im Schutzgebiete von Togo. Berechnet von Dr. Fritz Cohn.

German West Africa—Togo. *M. Deutsch. Schutzgeb.* **10** (1897): 193–204. ———
Resultate der meteorologischen Beobachtungen des Grafen Zech und des Lieuts. v. Seefried in Kratyi.
Resultate der meteorologischen Beobachtungen des Missionars Seeger in Amedjowe.
Geographische Ortsbestimmungen des Grafen Zech im Togogebiet 1896. Berechnet von L. Ambronn.

German West Africa—Togo. **Seidel.**
Aus allen Welttheilen **28** (1897): 801-818; **29** (1897): 67-74.
Lome, die Hauptstadt der Togokolonie. Ein Kulturbild aus Westafrika. Von H. Seidel.

Madagascar. *B.S.G. Marseille* **21** (1897): 163-174. **Sikora.**
Sept ans à Madagascar. Conférence de M. François Sikora.
The narrative of an Austrian naturalist.

Marocco. *B.S.G. Genève* **36** (1897): 116-124. **Goll.**
Au Moghreb-El-Aksa, de mars à mai 1892. Par M. Hermann Goll.

Portuguese East Africa. *Mém. S.G. Genève* **36** (1897): 63-74. **Junod.**
Les Ba-Ronga de la baie de Delagoa, leur pays, leurs mœurs. Par M. Henri Junod.

Portuguese East Africa—Makua. *B.S.G. Lisboa* **16** (1897): 127-145. **Grove.**
Africa oriental portugueza. A Macua-Communicação do ex^mo^ socio Daniel Grove.

Portuguese West Africa. *J. Anthrop I.* **27** (1897): 316-325. **Angus.**
A Year in Azimba and Chipitaland: the Customs and Superstitions of the People. By H. Crawford Angus.

Portuguese West Africa. *B S.G. Lisboa* **16** (1897): 223-248. **Lecomte**
Plan 'alto do sul de Angola. Missões portuguezas-Caconda, Catoco, Bihé e Bailundo . . . pelo Padre Ernesto Lecomte.

Portuguese West Africa—Benguella. *B.S.G. Lisboa* **16** (1897): 1-124. **Lecomte.**
Methodo pratico da lingua Mbundu fullada no districto de Benguella. Pelo Padre Ernesto Lecomte.

Portuguese West Africa—Cunene. *B.S.G. Lisboa* **16** (1897): 203-222. ——
Relatorio da viagem ao Cunene, emprehendida em ontubro de 1896 pelo governador do districto de Mossamedes. *With Map.*

Sahara. *Rev. Française* **22** (1897): 699-702. **Foureau.**
Sahara: La 9^e^ exploration. F. Foureau.

Sahara. *Ann. G.* **6** (1897): 461-464. **Schirmer.**
L'exploration du Sahara. Par M. H. Schirmer.
A criticism of M. P. Vuillot's book on the exploration of the Sahara.

St. Helena. ——
Colonial Reports—Annual. No. 213. St. Helena. Annual Report for 1896. London: Eyre & Spottiswoode, 1897. Size 10 × 6½, pp. 16.

South Africa. **Coillard.**
On the Threshold of Central Africa. A Record of Twenty Years' Pioneering among the Barotsi of the Upper Zambesi. By François Coillard. Translated from the French and Edited by his Niece, Catherine Winkworth Mackintosh. London: Hodder & Stoughton, 1897. Size 9½ × 6½, pp. xxxiv. and 664. *Map, Portraits, and Illustrations. Price* 15*s*. *Presented by the Publishers.*
This will be noticed amongst books on Africa.

South Africa—Barotse Country. *Mém. S.G. Genève* **36** (1897): 41-61. **Bertrand.**
Notes résumées sur un voyage d'exploration au pays des Ba-Rotse. Par M. Alfred Bertrand. *With Map.*

South Africa—Railways. *J. R. Colonial I.* **29** (1897): 8-35. **Tennant.**
The Railway System of South Africa. By the Hon. Sir D. Tennant, K.C.M.G.

Tunis. *B.S.G. Genève* **36** (1897): 151-170. **Ladame.**
En Tunisie.—Le Bardo-Carthage-Bizerte. Races historiques; temps antiques et temps modernes. Par M. le Dr. Paul Ladame.

NORTH AMERICA.

Bering Islands. *Iz. E. Sib. Sect. Imp. Russian G.S.* **28** (1897): 109-135. **Gerasimoff.**
The Bering Islands and their Fur-seal Industry. By A. Gerasimoff. *Map.* [In Russian. *Résumé* in German.]
A criticism of the physical, geographical, and ethnographical parts of Stejneger's report on the Russian Fur Seal islands, published in the U.S. Fish Commission's *Bulletin* for 1896.

Bering Islands—Fur Seals. *Contemporary Rev.* **72** (1897): 846-853. ———

The Fur-Seals: the American Case. By a British Naturalist.

Canada. **Coleman.**

Glacial and Inter-Glacial Deposits near Toronto. By A. P. Coleman. [Reprinted from the *Journal of Geology*, vol. iii. No. 6, September—October, 1895.] Chicago. Size 9½ × 7. *Illustrations. Presented by the Author.*

Canada. **Dawson.**

The Physical Geography and Geology of Canada. By George M. Dawson, C.M.G., F.R.S. Toronto, 1897. Size 7½ × 5, pp. 48. *Presented by the Author.*

This is an abstract from the 'Handbook of Canada,' published last year for the British Association meeting in Toronto.

Canada—Agriculture. ———

Appendix to the Report of the Minister of Agriculture. Experimental Farms. Reports . . . for 1887, pp. 58; 1888, pp. 142; 1889, pp. 152; 1890, pp. 314; 1891, pp 348; 1892, pp. 290; 1893, pp. 352; 1894, pp. 422; 1895, pp. 426; 1896, pp. 474. Ottawa, 1888–1897. Size 10 × 6½. *Plans and Illustrations. Presented by the Director of Central Experimental Farm, Ottawa, Canada.*

The experimental farms of Canada carry on a most important work with regard to the utilization of new land by the cultivation of the crops best suited to the soil and climate. For this purpose the products and methods of cultivation of other countries are carefully studied, and the reports contain many papers of general interest. They consist of reports from the director, horticulturist, chemist, entomologist and botanist, poultry manager, and the superintendents of the experimental farms at Nappan, N.S.; Brandon, Man.; Indian Head, N.W.T.; and Agassiz, B.C.

Canada—British Columbia. **Dawson.**

Some Observations tending to show the occurrence of Secular Climatic Changes in British Columbia. By G. M. Dawson, C.M.G., etc. [From the *Transactions* of the Royal Society of Canada. Second Series. 1896-97. Vol. ii. Section iv.] Ottawa: John Durie & Son, 1896. Size 10 × 7, pp. 159–166. *Presented by the Author.*

Canada—Nova Scotia. **Wrong.**

University of Toronto Studies. History, Second Series, vol. i. pp. 1-74. Louisbourg in 1745. The anonymous Lettre d'un Habitant de Louisbourg (Cape Breton), containing a narrative by an eye-witness of the siege in 1745. Edited with an English Translation by George M. Wrong, M.A., 1897. Size 11 × 7½. *Presented by the University of Toronto.*

A thrilling account of the siege of Louisbourg in an English translation, accompanied by the French text and a short introduction.

Canada—Ontario. **Bryce.**

The Lake of the Woods, its History, Geology, Mining, and Manufacturing. By George Bryce, LL.D. (The Historical and Scientific Society of Manitoba. Transaction, No. 49, February 23, 1897.) Winnipeg, 1897. Size 9 × 6, pp. 18. *Map and Illustrations. Presented by the Society.*

A brief historical account of an extremely interesting region, with notes on its present development and future prospects.

Canada—Ottawa. ———

Ottawa, the Capital of the Dominion. British Association for the Advancement of Science, Souvenir of Ottawa, Canada, 1897. Size 7 × 10, pp. 52. *Illustrations.*

Canada—Yukon District. *National G. Mag.* **8** (1897): 327-335. **Nelson.**

A winter weather record from the Klondike Region. By E. W. Nelson.

Canada—Yukon District. **Ogilvie.**

Department of the Interior. Information respecting the Yukon District, from the Reports of Wm. Ogilvie, Dominion Land Surveyor, and from other sources. Ottawa, 1897. Size 10 × 7, pp. 66. *Maps and Illustrations.*

This pamphlet is published by the Dominion Government to supply authentic information regarding the gold-bearing regions of the Yukon. It consists mainly of a detailed account of Mr. Ogilvie's explorations in 1887 and his subsequent reports.

Mexico. *B. American G.S.* **29** (1897): 249-260. **Wilson.**

Topography of Mexico. By Herbert M. Wilson. *With Map.*

This article is illustrated by a rough hypsometrical map of Mexico compiled from 2000 known altitudes. It gives a careful account of the detailed configuration of the country.

Mexico and Guatemala—Boundary. *B. American G.S.* **29** (1897): 281–330. ———

Mr. Blaine and the Boundary Question between Mexico and Guatemala. By the Mexican Minister at Washington.

Mexico and Guatemala. *Verh. Ges. Erdk. Berlin* **24** (1897): 397–413. **Seler.**

Herr Dr. E. Seler: Ueber seine Reisen in Mexico und Guatemala.

Mexico—Archæology. **Holmes.**

Field Columbian Museum. Publication 16. Anthropological Series. Vol. i. No. 1. Archeological Studies among the ancient Cities of Mexico. By William H. Holmes. Part ii. Monuments of Chiapas, Oaxaca, and the Valley of Mexico. Chicago, 1897. Size 10 × 6½, pp. 139–338. *Illustrations and Maps.*

Mexico—Baja California. *B. American G.S.* **29** (1897): 271–280. **Eisen.**

Explorations in the Cape Region of Baja California. By Gustav Eisen. *With Map.*

On the extreme south of the peninsula of lower California.

Mexico—Caves. *Aus allen Welttheilen* **28** (1897): 783–791. ———

Ein Ausflug nach den Höhlen von Cacahuamilpa.

Niagara Falls. **Gilbert.**

Niagara Falls and their History. By G. K. Gilbert.—National Geographic Monographs. Vol. i. No. 7. September, 1895. New York: American Book Company. Size 11½ × 8. *Illustrations.*

United States—Alaska. *L'Universo* **7** (1897): 323–328. **Abruzzi.**

La spedizione del Duca degli Abruzzi all' Alaska. *With Maps and Illustrations.*

A description of the ascent of Mount St. Elias by the Duke of the Abruzzi.

United States—Alaska. *National G. Mag.* **8** (1897): 322–327. **Dickey.**

The Sushitna River, Alaska. By W. A. Dickey. *With Map.*

United States—Atlantic Coast. **Shaler.**

Beaches and Tidal Marshes of the Atlantic Coast. By N. S. Shaler.—National Geographic Monographs. Vol. i. No. 5. July, 1895. New York: American Book Company. Size 11½ × 8.

United States—California. **Diller.**

Mount Shasta, a typical Volcano. By J. S. Diller.—National Geographic Monographs. Vol. i. No. 8. October, 1895. New York: American Book Company. Size 11½ × 8. *Illustrations.*

United States—Florida. *P. American Philosoph. S.* **35** (1896): 329–448. **Cushing.**

Exploration of Ancient Key Dwellers' Remains on the Gulf Coast of Florida. By Frank Hamilton Cushing. *With Plates.*

An interesting account of the discovery and exploration of ancient dwellings built on the coral keys on the west coast of Florida by a primitive shellfish-eating tribe. Minute plans of the shell-mounds, and illustrations of the utensils found complete the memoir.

United States—Harbours. **Bradford.**

Treasury Department, United States Coast and Geodetic Survey. W. W. Duffield, Superintendent. Bulletin No. 36. Table of Depths for Channels and Harbors, Coasts of the United States. Arranged and compiled by Gershom Bradford. Washington, 1897. Size 11½ × 9½, pp. 110. *Presented by the Survey.*

United States—Nevada, Lakes. **Russell.**

Present and Extinct Lakes of Nevada. By Israel C. Russell.—National Geographic Monographs Vol. i. No. 4. June, 1895. New York: American Book Company. Size 11½ × 8. *Maps.*

United States—New England. **Davis.**

The Physical Geography of Southern New England. By William Morris Davis.—National Geographic Monographs. Vol. i. No. 9. November, 1895. New York: American Book Company. Size 11½ × 8. *Illustrations.*

United States—New Mexico. *B. American G.S.* **29** (1897): 261–270. **Duff.**

The Prehistoric Ruins of the Rio Tularosa. By U. Francis Duff. *With Illustrations.*

United States—Northern Appalachians **Willis.**

The Northern Appalachians. By Bailey Willis.—National Geographic Monographs. Vol. i. No. 6. August, 1895. New York: American Book Company. Size 11½ × 8. *Map.*

United States—Oregon.

Mazama: a Record of Mountaineering in the Pacific North-West. Crater Lake Number. [Vol. i. No. 2.] Portland, Oregon, 1897. Size 10 × 7, pp. 139-298. *Maps and Illustrations.*

A special note on Crater lake is given on p. 182.

United States—Rainfall. **Henry.**

U.S. Department of Agriculture, Weather Bureau. Bulletin D. Rainfall of the United States, with Annual, Seasonal, and other Charts. Prepared . . . by Alfred J. Henry. Washington, 1897. Size 11½ × 9½, pp. 58.

United States—Schuylkill River. *J. Franklin I.* **144** (1897): 366-379. **Carter.**

The Upper Schuylkill River. By Oscar C. S. Carter. *With Sketch-map.*

A study of the effect of acid water from collieries on the river, and the amelioration due to tributaries bringing in much carbonate of lime in solution.

United States—Southern Appalachians. **Hayes.**

The Southern Appalachians. By C. Willard Hayes.—National Geographic Monographs. Vol. i. No. 10. December, 1895. New York: American Book Company. Size 11½ × 8. *Map.*

United States—Virginia. **Boyd.**

Grayson County, Virginia. By C. R. Boyd. Economic: Ores, Stones, etc. Analysis, Agricultural Products: Timber, Soils, Manufactures, Transportation, Summaries. Scientific: Geology, Mineralogy. Independence, Va.: Greek D. Brown, 1897. Size 8 × 5½, pp. 44. *Map. Presented by the Author.*

United States—Western States. **Denburgh.**

The Reptiles of the Pacific Coast and Great Basin, an account of the species known to inhabit California, and Oregon, Washington, Idaho, and Nevada. By John Van Denburgh, PH.D.—Occasional Papers of the California Academy of Sciences, V. San Francisco, 1897. Size 10 × 6½, pp. 236. *Illustrations. Presented by the Academy.*

CENTRAL AND SOUTH AMERICA.

Argentine—Patagonia. *National G. Mag.* **8** (1897): 305-319. **Hatcher.**

Patagonia. By J. B. Hatcher. *With Map and Illustrations.*

Mr. Hatcher's expedition is noticed in the *Journal* for January, vol. xi. p. 72.

Bolivia and Peru. *Aus allen Weltteilen* **29** (1897): 73-82. **Nusser-Asport.**

Kautschuk und Gold im peruanisch-bolivianischen Grenzgebiet. Von Chr. Nusser-Asport.

On the indiarubber and gold resources of the boundary district between Peru and Bolivia.

Brazil. **Princess Therese of Bavaria.**

Meine Reise in den Brasilianischen Tropen. Von Therese Prinzessin von Bayern. Berlin: D. Reimer, 1897. Size 10½ × 7, pp. xvi. and 544. *Portrait, Map, and Illustrations. Price* 14*s. Presented by the Publisher.*

The Princess Therese of Bavaria is to be congratulated on her literary style and on the excellent descriptions which she has given, not only of the scenes she visited in 1888, but of the large scientific collections which she brought back to Europe. The narrative takes the form of a diary illustrated with numerous photographs and reproductions of drawings from sketches by the authoress. The journey was no mere holiday trip to the coast towns and along the railways, but partook of a more adventurous character, including a journey up the Amazon and several excursions into the forest. Numerous scientific observations are interspersed, especially with regard to plants, the Princess being a keen botanist. Her collections included two new species. Special historical value is given to the book by the description of visits paid to the late Emperor of Brazil so soon before he was compelled to abdicate.

Brazil—Bahia. *Rev. Trim. I.G. e Hist. Bahia* **4** (1897): 233-344.

Riqueza Mineral do Estado da Bahia.

On the mineral wealth of the State of Bahia.

Brazil—Minas Geraes. *Meteorolog. Z.* **14** (1897): 405-415. **Draenert.**

Das Höhenklima des Staates Minas Geraes, Brasilien. Von Prof. F. M. Draenert.

Central America. *Z. Ges. Erdk. Berlin* **32** (1897): 137–146. **Sapper.**

Die ersten Kriegszüge der Spanier im nördlichen Mittel-Amerika. Von Dr. Carl Sapper. *With Map.*

On the earliest Spanish expeditions in Northern Central America.

Chile. *Nouv. Archives Miss. Sci. et Littéraires* **7** (1897): 111–242. **Bel.**

Rapport sur une mission scientifique au Chili et dans le nord de la Bolivie (1888–89). Par M. J.-M. Bel. *With Maps and Plate.*

Observations made in 1888–89 during a stay of three months in Chile and six months in Bolivia. The names and tonnage of thirty-two steamers over 4000 tons, which make the voyage regularly to Chile, are given in a table; and many particulars of the routes are given in the text. There is a detailed itinerary of the journey on land, with an account of the geology. This is followed by a long list of the Chilian islands with their positions, and other lists of peninsulas, capes, gulfs, bays, etc., apparently transcribed from maps. A history of Chile follows; but there is no account of Bolivia.

Chile and Argentine. *Ymer* (1897): 199–220. **Dusén.**

Från Patagoniens vestkust till pampasområdet på Kordillerans östra sida. Af P. Dusén. *With Map.*

The map shows the whole course of the west-flowing Rio Aysen, on the scale of 1 : 200,000, but without latitudes or longitudes.

Paraguay and Bolivia. *Mem. S.G. Italiana* **7** (1897): 45–62. **Boggiani.**

La questione dei confini tra le repubbliche del Paraguay e della Bolivia. Nota del Socio Guido Boggiani.

West Indies—Caribs. *J. Anthrop. I.* **27** (1897): 293–315. **Rat.**

The Carib Language as now spoken in Dominica, West Indies. By Joseph Numa Rat.

AUSTRALASIA AND PACIFIC ISLANDS.

Australia—Rock Carvings. *P. American Philosoph. S.* **36** (1897): 195–208. **Mathews.**

Australian Rock Carvings. By R. H. Mathews. *With Plate.*

The positions where the rock-carvings described are to be found are given in each case by exact references to the government map.

British New Guinea—Kiriwina. **Macgregor.**

Despatch reporting Visit to Kiriwina. By Sir William Macgregor. [No. 44.] 1897. Size 13½ × 8½, pp. 4. *Presented by the Colonial Office.*

Hawaii. *Ann. Hydrographie* **25** (1897): 469–471. **Stege.**

Kahului auf der Insel Maui, Hawai-Inseln. Von Kapt. J. H. Stege.

Marshall Islands. *M. Deutsch. Schutzgeb.* **10** (1897): 191–192. ———

Verzeichniss der nunmehr endgültig berechneten geographischen Positionen der astronomischen Beobachtungspfeiler in der Südsee sowie der sich hieran anschliessenden Punkte in den bis jetzt vermessenen Gebieten.

Melanesia. *J. Anthrop. I.* **27** (1897): 181–191. **Pfeil.**

Duk Duk and other Customs as Forms of Expression of the Melanesians' Intellectual Life. By Graf v. Pfeil.

New Guinea—The Toaripi Tribe. *J. Anthrop. I.* **27** (1897): 326–334. **Chalmers.**

Toaripi. By the Rev. Dr. James Chalmers.

New Hebrides. **Le Gouz de Saint-Seine.**

A travers le Monde, Tour du Monde **3** (1897): 401–404.

Les Nouvelles-Hébrides, aperçu historique et géographique. Par le comte Jean Le Gouz de Saint-Seine. *With Illustrations.*

New Zealand. **Smith.**

Report of the Department of Lands and Survey, New Zealand, for the year 1896–97. By Stephenson Percy Smith, Surveyor-General. Wellington, 1897. Size 13½ × 8½, pp. xx. and 216. *Maps, Plates, and Sections.*

This Report maintains its character for geographical interest. It not only gives a full account of the surveys which have been carried out in the year, but admirable maps showing the progress of the survey as a whole, the system of roads throughout New Zealand, and detailed work in several districts, including the summit of Tongariro. The Report is illustrated by a number of very fine photographs of scenery, reproduced on a large scale.

Polynesia—Plant- and Tree-Names. *J. Polynesian S.* **6** (1897): 123-140. **Christian.**
On the Distribution and Origin of some Plant- and Tree-Names in Polynesia and Micronesia. By F. W. Christian, B.A.

Queensland. *P. and T. Queensland Br. R.G.S. Australasia* **12** (1897): 20–25. **Collins.**
The South-Eastern Highlands of Queensland. By R. M. Collins.

Queensland. **Rands.**
Queensland. Department of Mines. Geological Survey. Bulletin No. 3. Mount Cannindah Copper and Gold Deposits. By William H. Rands. Brisbane, 1896. Size 8½ × 5½, pp. 10. *Plan.*

Queensland. *Scottish G. Mag.* **13** (1897): 561–572, 624–635. **Thomson.**
Queensland. By J. P. Thomson. *With Illustrations and Map.*

Queensland—Cape York Peninsula. **Embley.**
P. and T. Queensland Br. R.G.S. Australasia **12** (1897): 26–29.
The Western Watershed of the Upper Portion of Cape York Peninsula. By J. T. Embley.

Queensland—Pikedale Goldfield. **Maitland.**
Queensland. Department of Mines, Geological Survey. Bulletin No. 2. Notes on the Pikedale Goldfield. By A. Gibb Maitland. Brisbane, 1895. Size 9 × 5½, pp. 10.

Rarotonga. *Chronicle London Miss. S.* (1897): 265–266. **Hutchin.**
Rarotonga of To-day. By Rev. John J. K. Hutchin.

South Australia. **Hübbe.**
South Australia. Journal of the Stock Route Expedition from South to Western Australia, 1895–96, under command of S. G. Hübbe, 1897. Size 13½ × 8½, pp. 50. *Presented by the Secretary of State for the Colonies.*
A note on this expedition will be given.

South Australia—Meteorological Observations. **Todd.**
1894. Meteorological Observations made at the Adelaide Observatory and other places in South Australia and the Northern Territory, during the year 1894, under the direction of Charles Todd, K.C.M.G., etc. Adelaide, 1897. Size 13 × 8½, pp. xiv. and 174. *Maps. Presented by the Adelaide Observatory.*

Western Australia. ———
Western Australia. Report of the Department of Mines for the year 1896, with Supplementary Notes on part of 1897. Perth, 1897. Size 13 × 8½, pp. 76. *Maps, Sections, etc.*

Western Australia. ———
Western Australia. Department of Mines. Gold-mining Statistics for the Half-year ending June 30, 1897. [Perth, 1897.] Size 13½ × 8½, pp. 28. *Diagram.*
The gold exported in 1895 exceeded 231,000 oz., in 1896 it was over 281,000 oz., and in the first half of 1897 the export was more than 265,000 oz.

POLAR REGIONS.

Arctic. *B.S.G. Română* **18** (1897): 135-200. **Assan.**
Călătorie în regiunile Polare nordice. Conferințã tinuțã de d. B. G. Assan. *With Maps and Illustrations.*
On a voyage along the coast of Norway to Spitsbergen in the *Erling Jarl* in August, 1896.

Arctic—Andrée's Expedition. *Verh. Ges. Erdk. Berlin* **24** (1897): 413-423. **Baschin.**
Die Abfahrt der Andrée'schen Ballon-Expedition zum Nordpol und ihre Aussichten. Von Otto Baschin.

Arctic—Andrée's Expedition. *Ymer* **17** (1897): 221-246. **Celsing and Ekholm.**
Andrées ballonguppstigning 1897. Af G. R. Celsing. *With Illustrations.*
Om Andrées ballongfärd under de två första dagarne. Af Nils Ekholm. *With Map.*

Arctic—Glaciers. *Rev. Scientifique* **8** (1897): 140–142. **Rabot.**
Les variations des glaciers arctiques. Par M. Ch. Rabot.
A comparison of the glaciers of Greenland with those of the Alps.

Arctic—Jackson-Harmsworth Expedition. **Brice.**

J. Manchester G.S. **13** (1897): 73–80.

The Jackson-Harmsworth Polar Expedition. By Mr. Arthur Montefiore Brice. *With Portraits.*

Greenland. **Putnam.**

The Scientific Work of the Boston Party on the Sixth Peary Expedition to Greenland. Report A. Magnetic and Pendulum Observations. By G. R. Putnam. [From *Technology Quarterly*, vol. x. No. 1, March, 1897.] Pp. 56–132. Size 10½ × 7. *Maps and Illustrations. Presented by the Author.*

This records part of the work done by one of the independent scientific parties landed by Lieut. Peary in Greenland, and taken back by him in 1896. The observations are detailed, and the instruments employed minutely described and figured.

Greenland—Cornell Glacier. **Tarr.**

The Margin of the Cornell Glacier. By Ralph S. Tarr. [From the *American Geologist*, vol. xx. September, 1897.] Size 9½ × 6½, pp. 139–156. *Plates. Presented by the Author.*

A minute study of the end of a great glacier, with numerous fine illustrations.

Novaya Zemlya. *Zemlevedenie* **3**, 1896 (1897): 158–163. ———

Novaya Zemlya and its latest Exploration. Anon. [In Russian.]

An account of the expedition of Engelhardt and Chernysheff in 1895, and references to the eclipse expeditions of 1896.

Spitsbergen. *Alpine J.* **18** (1897): 501–506. **Gatty.**

A Spitsbergen Glacier Expedition. By Victor H. Gatty.

An excursion from Recherche bay in 1897.

MATHEMATICAL GEOGRAPHY.

Geodesy. ———

Verhandlungen der österreichischen Gradmessungs-Commission. Protokoll über die am 21 April 1897 abgehaltene Sitzung. Wien, 1897. Size 9 × 6½, pp. 16.

Geodesy. *Math. u. Naturw. Berichte Ungarn* **13** (1897): 365–379. **Kövesligethy.**

Ueber eine neue Methode der Morphometrie der Erdoberfläche. Von Dr. R. von Kövesligethy.

The author introduces a method of mathematical treatment for the morphometry of the surface of the globe similar to that employed by Gauss for the discussion of terrestrial magnetism. As the geoid is treated in geodesy he treats the *oroid* in orometry.

Geodesy. **Schumann and Kühnen**

Veröffentlichung des Königl. Preussischen Geodätischen Institutes. Die Neumessung der Grundlinien bei Strehlen, Berlin und Bonn ausgeführt durch das Geodätische Institut. Unter Mitwirkung von R Schumann bearbeitet von Fr Kühnen. Berlin: P. Stankiewicz, 1897. Size 11½ × 9, pp. iv. and 122. *Plates. Presented by the Institute.*

On the re-measurement of three bases in the German system of triangulation.

Latitude Changes. *B.A. Imp. Sci. St.-Pétersbourg* **5** (1896): 223–236. **Ivanof.**

A. Ivanof. Déclinaisons de 14 étoiles employées, pour les recherches sur la variation de la latitude de Kasan. [In Russian.]

Problems in Geography. **Aspiazu.**

Sociedad Geografica de La Paz. Bolivia. Conferencias y escritos cientificos del Dr. Don Agustin Aspiazu. 1897. Size 8½ × 5½, pp. 256. *Plates. Presented by the Author.*

The greater part of this little book is occupied with the discussion of various problems in mathematical geography and astronomy, including the determination of position, the measurement of gravity, etc.

Topography. **Corbal'lis.**

Topography made easy. A complete course for officers preparing for the Staff, College, Promotion, and the Militia Military Competitive Examinations. Compiled by James Corball'is. London: Gale and Polden, [1896]. Size 7½ × 5, pp. 124. *Illustrations. Price 4s.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Bog-bursts. **Früh.**

Ueber Moorausbrüche. Von Jakob Früh.—Vierteljahrsschrift der Naturforschenden Gesellschaft in Zürich. Sonderabdruck aus Jahrgang xlii., 1897. Size 9 × 6¼, pp. 202–238. *Presented by the Author.*

A discussion of bog-bursts, with special reference to the great outburst of a bog in the Killarney district in 1896.

Climate Changes. *J. Geology* **5** (1897): 653–683. **Chamberlin.**

A group of hypotheses bearing on climatic changes By T. C. Chamberlin.

Colour of Water. *Ann. Hydrographie* **25** (1897): 432–442. **Hasenkamp.**

Die Farbe der natürlichen Gewässer. Mit besonderer Berücksichtigung der Arbeiten von Spring, zusammenfassend dargestellt von Dr. H. von Hasenkamp.

Geology. **Selwyn.**

Presidential Address on the Origin and Evolution of Archæan Rocks, with Remarks and Opinions on other Geological subjects; being the result of personal work in both hemispheres from 1845 to 1895. By Alfred R. C. Selwyn, C.M.G., F.R.S., etc. [From the *Transactions of the Royal Society of Canada*, Second Series, 1896–97. Vol. ii. Proceedings.] Ottawa: J. Durie & Son, 1896. Size 10 × 6¼, pp. 22.

Glacial Formations. *J. Geology* **5** (1897): 730–743. **Bannister.**

The Drift and Geologic Time. By H. M. Bannister, M.D.

Glaciers. **Lapparent.**

Une nouvelle Théorie des anciens Glaciers. Par A. de Lapparent. Extrait de la *Revue des Questions Scientifiques*, Octobre 1897. Louvain, 1897. Size 10 × 6¼, pp. 24. *Presented by the Author.*

This will be specially noticed.

Ice. *Atti R. A. Lincei, Rendiconti* **6** (1897): 262–269. **Straneo.**

Sulla conducibilità termica del ghiaccio. Nota di Paolo Straneo.

On the thermal conductivity of ice, a matter of considerable importance in many departments of physical geography.

Land-forms—Valleys. *Mém. S.G. Genève* **36** (1897): 23–40. **Ritter.**

Origine de l'emplacement des cours d'eau. Par M. Étienne Ritter.

A study of the conditions which originally determined the position and direction of river-valleys.

Meteorite. *C. Rd.* **125** (1897): 894–897. **Meunier.**

Sur quelques circonstances particulières qui paraissent avoir accompagné la chute d'une météorite le 9 avril 1891 à Indarek, en Transcaucasie. Note de M. Stanislas Meunier.

Particulars of the fall of a meteorite weighing about 60 lbs. on April 9, 1891, in the Transcaucasus. Ten hours after the fall the mass was still so hot that it could not be touched with the hand, but cool enough to be carried wrapped up in a cloak.

Meteorology—Evaporation *T.S. African Philosoph. S.* **9** (1897): 8–19. **Alston.**

Comparison of Evaporation Results in New South Wales and South Africa. By Garwood Alston. *With Diagrams.*

Mountains. *Knowledge* **20** (1897): 282–285. **Cole.**

The Heart of a Continent. By Grenville A. J. Cole. *With Illustrations.*

Oceanography. **Dickson.**

Report on Physical Investigations carried out on board H.M.S. *Research*, during August, 1896. By H. N. Dickson. From Part iii. Fifth Annual Report of the Fishery Board for Scotland, pp. 280–296. Size 10 × 6¼. *Presented by the Author.*

Describes the continuation of Mr. Dickson's valuable researches for the Scottish Fishery Board in the North Atlantic. See note on p. 185.

Oceanography. *P. Linnean S.* (1896-97): 16–49. **Günther.**

The President's Anniversary Address.

Dr. Günther dealt in his address with the fauna of the deep sea, taking up each of the oceans or divisions of oceans in turn, and showing the dependence of their living forms upon the physical conditions.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropology. *Naturw. Wochenschrift* **12** (1897): 541–545. **Mewes.**

Ueber die Abhängigkeit der Nervenreizbarkeit der Völker von terrestrischen und kosmischen Erscheinungen. Von Rudolf Mewes.

On the influence of geographical and physical environment on the powers of human perception.

Anthropology. *T.R.S. Literature* **19** (1897): 1–58. **Phené.**

Dendrophoria. Researches for and Examination of Still Existing People, Languages, Customs, and Remains mentioned by Herodotus, Strabo, etc., in India, Thrace, Italy, and Western Europe. By Dr. J. S. Phené. *With Illustrations.*

Archæology. *T.R.S. Literature* **19** (1897): 59–78. **Petrie.**

The Relations of Egypt and Early Europe. By Prof. Flinders Petrie, D.C.L. *With Illustrations.*

Historical. **Maspero and Sayce.**

The Struggle of the Nations, Egypt, Syria, and Assyria. By G. Maspero. Edited by A. H. Sayce. Translated by M. L. McClure. London: Society for Promoting Christian Knowledge, 1896. Size 11 × 7½, pp. xii. and 794. *Map, Coloured Plates, and Illustrations. Price* 25*s. Presented by the Publishers.*

This is a handsome volume, in which the earliest history of the Eastern Mediterranean lands is told from the monuments, illustrated by a large number of reproductions of drawings and photographs of sites and figures. Beginning with the first Chaldæan empire, the history follows the growth of Nineveh and Phœnicia; details the Egyptian conquest of Syria and its organization as part of the Theban empire, the rise of the Hittites, and the eventual overthrow of the Theban empire; the growth of Assyrian power, and the familiar wars of the Hebrews and Philistines, which are here set in their true place with regard to the historic development of the ancient world. Numerous sketch-maps are used in illustration of the event.

Historical—da Gama. *B.S.G. Lisboa* **16** (1897): 191–202. **Levy.**

Les découvertes de Gama et la colonisation portugaise. Par Victor Levy.

Historical—Map. *Z. Ges. Erdk. Berlin* **32** (1897): 65–111, 191–218. **Kretschmer.**

Die Katalanische Weltkarte der Biblioteca Estense zu Modena. Von Dr. Konrad Kretschmer. *With Map.*

Historical—Noreia. *M. k.k. G. Ges. Wien* **40** (1897): 621–747. **Pichler.**

Die Noreia des Polybios und jene des Castorius. Von Fritz Pichler.

On the site of Noreia.

Historical—Verrazano *Mem. S.G. Italiana* **7** (1897): 165–190. **Peragallo.**

Intorno alla supposta identità di Giovanni Verrazzano, col corsaro francese Giovanni Florin. Memoria del socio corrispondente don Prospero Peragallo.

Place-Names. *B.A.R. Belgique* **31** (1896): 307–313. **Wauters.**

Quelques mots sur les progrès de la toponymie en Belgique. Par Alphonse Wauters.

Toponymy, M. Wauters explains, is a new science which takes up the names of places and studies them with a view to elucidating history and geography. The paper deals in part with M. Wauters' priority in introducing this study to notice in Belgium.

Shamanism. *Zemlevedenie* **4** (1897): 29–48. **Stepanovsky.**

Shamanism and the Shamans. By J. Stepanovsky. *Illustrations.* [In Russian.]

BIOGRAPHY.

Biography. **Smith.**

Twelve Indian Statesmen. By George Smith, C.I.E., LL.D. London: John Murray, 1897. Size 8½ × 5½, pp. x. and 324, *frontispiece. Presented by the Author.*

Dr. George Smith here gives well-proportioned biographies of twelve builders of the Indian empire, including Charles Grant (1746–1823), Sir Henry Lawrence (1806–1857), Lord Lawrence of the Punjab (1811–1879), Sir James Outram (1803–1863), Sir Donald M'Leod (1810–1872), Sir Henry Marion Durand (1812–1871), General Colin Mackenzie (1825–1881), Sir Herbert B. Edwardes (1819–1868), John Clark Marshman (1794–1877), Sir Henry Sumner Maine (1822–1888), Sir Henry Ramsay (1816–1893), Sir Charles U. Aitchison (1832–1896).

Elias. *Deutsche Rundschau G.* **20** (1897): 88. ——

Ney Elias. *With Portrait.*

Lamblardie. *Rev. G.* **41** (1897): 116–127, 172–185, 245–255. **Filon.**

L'ingénieur Lamblardie (1747–1797), successeur de Perronet à l'École des ponts et chaussées et fondateur, avec Monge, de l'École des travaux publics (École polytechnique). Par F. Filon.

Landor. *A travers le Monde, Tour du Monde* **3** (1897): 364. ——

La vie de l'Explorateur H. Savage Landor.

Owen. **Bovill and Askwith.**

'Roddy Owen' (Brevet-Major Lancashire Fusiliers, D.S.O.). A Memoir. By his sister Mrs. Bovill and G. R. Askwith. With Portraits and Maps. London: John Murray, 1897. Size 9 × 6, pp. viii. and 280. *Price* 12*s*. *Presented by the Publisher.*

The biography of a typical British officer, who, turning his attention from horse-racing to special service work, was engaged in military operations in West Africa, Uganda, Unyoro, Chitral, and the Egyptian Sudan. Particulars are given of 812 races in which he rode, and extracts from many of his letters while in remote regions on active service during the last four years of his life.

Richter. *Deutsche Rundschau G.* **20** (1897): 85–87. ——

Eduard Richter. *With Portrait.*

Prof. Richter of Graz, well known for his researches in physical geography.

Veth. *Jaarb. k. A. Wetens. Amsterdam*, 1896 (1897): 1–42. **V. d. Lith.**

Pieter Johannes Veth. Door P. A. v. d. Lith.

Vogel. *Petermanns M.* **43** (1897): 1–6. **Wagner.**

Carl Vogel. Nachruf von Prof. Dr. H. Wagner.

The late Herr Vogel, who died on July 16, 1897, was associated with Petermann, Behm, and Berghaus in securing to the geographical establishment of Justus Perthes the high reputation it has so long enjoyed for the production of the highest class of cartographical work.

GENERAL.

British Colonies. *J.S. Arts* **46** (1897): 7–16. **Burne.**

The Colonies: their Arts, Manufactures, and Commerce. By Major-General Sir Owen Tudor Burne, G.C.I.E., etc.

A general discussion of the growth of the British Colonies as a whole.

British Empire. *Fortnightly Rev.* **62** (1897): 803–816. **Coubertin.**

A French View of the British Empire. By Baron Pierre de Coubertin.

Discusses the colonies and their relation to the mother-country.

Educational—Methods. **Davis.**

University of the State of New York. The present trend of Geography. A Paper delivered at the thirty-fifth University Convocation, Senate Chamber, Albany, N.Y. June 29, 1897. By Prof. William Morris Davis. Albany, 1897. Size 10 × 7, pp. [12]. *Presented by the Author.*

An excellent summary of the present position of geographical education in the United States, and the advances that are being made.

French Geographical Congress. *B.S.G. Com. Havre* **14** (1897): 139–182. **Favier.**

Rapport sur le Congrès National des Sociétés Françaises de Géographie, xviii^e^ Session, tenu à Saint-Nazaire du 1^er^ au 8 août 1897. Par M. E. Favier.

Hunting-Maps. **Marcel.**

A propos de la Carte des Chasses. Par Gabriel Marcel. Extrait de la *Revue de Géographie* (vol. 41 (1897), pp. 344–356). Paris: Ch. Delagrave, 1897. Size 10 × 6½, pp. 16. *Presented by the Author.*

An interesting account of the old French maps of hunting-districts, drawn as a guide for the guests invited to a hunt.

Navigation. *National G. Mag.* **8** (1897): 266–272. **Littlehales.**

The Compass in Modern Navigation. By G. W. Littlehales.

Portuguese Colonies. **Vasconcellos.**

As Colonias Portuguezas. Geographia physica, politica e economica. Por Ernesto J. De C. E. Vasconcellos. Lisbon, 1896. Size 7½ × 5½, pp. 444. *Presented by the Author.*

A handbook of the Portuguese colonies in the Cape Verdes, East and West Africa, India, Macao, and Timor, forming a detailed description of all the colonial possessions of Portugal, very clearly arranged, and the descriptions fortified with official statistics,

Prisons. **Tallack.**

Penological and Preventive Principles, with special reference to Europe and America, etc., etc. By William Tallack. Second Edition. London: Wertheimer, Lea & Co., 1896. Size 9 × 6, pp. xii. and 480. *Price 8s. Presented by the Howard Association.*

Prospector's Handbook. **Anderson.**

The Prospector's Handbook. Seventh Edition. By J. W. Anderson. London: Crosby Lockwood & Son, 1897. Size 7 × 5, pp. xii. and 176. *Illustrations. Presented by the Author.*

Queensland Geographical Society. **Muir.**

The Royal Geographical Society of Australasia, Queensland: an Historical Review. By Alexander Muir, J.P., Vice-President. [Read at the Annual General Meeting of the Royal Geographical Society of Australasia, Brisbane, July 17, 1896.] Size 9 × 5½, pp. 20. *Presented by the Author.*

Rain-gauge. **Hellmann.**

Ein neuer registrirender Regenmesser. Von G. Hellmann. From *Meteorologische Zeitschrift*, Februar, 1897. Size 10½ × 7, pp. [4]. *Illustration and Diagram.*

Scurvy. **Wright.**

On the Pathology and Therapeutics of Scurvy. By A. E. Wright, M.D. [From 'Army Medical Report,' 1895.] Size 10 × 6½, pp. 12.

Smithsonian Tables. **Gray.**

Smithsonian Miscellaneous Collections. 1038. Smithsonian Physical Tables. Prepared by Thomas Gray. Washington: the Smithsonian Institution, 1896. Size 10 × 6½, pp. xxxiv. and 302. *Presented by the Smithsonian Institution.*

Sudan Almanac.

Sudan Almanac, 1897. Compiled at the Intelligence Division, War Office (London). Calculations made at the Nautical Almanac Office. Size 6 × 4½, pp. 24.

NEW MAPS.

By J. COLES, *Map Curator*, R.G.S.

EUROPE.

Austria-Hungary. **Artaria.**

Artaria's Eisenbahn- und Post-Communications-Karte von Oesterreich-Ungarn, 1898. Scale 1: 1,700,000 or 18·8 stat. miles to an inch. Mit Stationsverzeichnis. Verlag von Artaria & Co., Wein. *Price 1 fl.*

England and Wales. **Bartholomew.**

New Reduced Ordnance Survey of England and Wales. Sheet 25, Huntingdon, Cambridge, etc.; Sheet 19, Essex; Sheet 26, Bedford and Hertford, etc. Scale 1: 126,720 or 2 stat. miles to an inch. J. Bartholomew & Co., Edinburgh. 1897. *Price 2s. each, mounted on cloth. Presented by the Publishers.*

England and Wales. **Ordnance Survey.**

Publications issued since December 8, 1897.

1-inch—General Maps:—

ENGLAND AND WALES:—92, 94, 261 and 262, 297, hills engraved in black and brown; 107, 121, hills photozincographed in brown; 9, 13, 29, 249, 256 (revised), engraved in outline. 1*s.* each.

6-inch—County Maps (revised):—

ENGLAND AND WALES:—**Essex**, 32 N.W., 42 S.W., 43 S.W., 44 N.E., 45 S.E., 46 S.W., 51 N.E., 52 S.W., 53 N.E., S.W., 54 N.E., S.W., 55 N.E., S.W., 60 N.W., N.E., 62 N.W., N.E. **Hampshire**, 20 S.E., 54 N.E., S.W., 56 N.E., 60 S.E., 67 S.E., 68 N.W. **Kent**, 17 N.W., N.E., S.E., 18 N.W., 20 S.W., 29 N.E., 52 S.W. **Middlesex**, 11 S.W., 16 N.W., 20 S.W., S.E. **Northumberland**, 78 N.W., N.E., 79 N.W., 71 S.W. **Surrey**, 13 S.W., 21 S.W., 23 N.W., 27 N.W., S.W., S.E., 32 S.E., 41 N.W. **Wiltshire**, 76 N.E. **London**, 2 S.W., 6 N.W., 9 S.E. 1*s.* each.

25-inch—Parish Maps (revised):—

ENGLAND AND WALES:—**Cheshire**, XIX. 16; XX. 14, 15; XXVIII. 3, 4, 6, 10, 14, 16; XXXVI. 6, 7, 10; XLIII. 2, 3, 6, 7, 9, 11, 12, 14, 15; L. 3, 11. **Durham**, IV. 5; XXXVII. 3, 7, 8, 11; XLII. 11; XLV. 12, 14, 16; XLVIII. 11; XLIX. 4, 10;

L. 1, 2, 5, 6, 7, 9, 11, 13; LIV. 1, 6, 11, 12; LV. 1, 2, 7, 8, 12, 13, 14, 15, 16; LVI. 1, 5, 9; LVII. 1, 2, 6, 7, 8, 16. **Hampshire**, LXXV. 1, 2, 4, 10; LXXVI. 7, 8, 14, 16; LXXVIII. 1; LXXXII. 3, 4; LXXXIV. 4, 8; LXXXVIII. 2, 6, 7, 9, 10, 15, 16; LXXXIX. 4, 7, 11; XC. 3, 5, 7, 12; XCI. 14, 15; XCVI. 2, 4, 8. **Essex**, II. 5, 8, 9, 10, 12, 13; III. 11, 12; IV. 7; V. 6, 7, 8, 9, 10; VI. 1, 5, 9, 10, 11, 13, 14; VIII. 2; XII. 2, 8, 12; XIII. 2; XVIII. 2, 4; XX. 7, 10; XXII. 6, 7, 8, 12, 15; XXVIII. 9; XXIX. 12; XXX. 1, 5, 6, 9, 10, 11, 13, 15; XXXIX. 1, 5, 6, 7, 13, 14; XLVIII. 7; LXV. 10; LXXXIV. 15; LXXXIX. 2, 3. **Hertfordshire**, XIV. 10; XXII. 12. **Kent**, II. 3, 7, 13; V. 9, 13; VII. 7, 11; IX. 1, 2, 5, 7, 9, 11, 12, 13, 14; X. 7; XI. 13, 15, 16; XVI. 1; XVIII. 16; XIX. 16; XXI. 9, 12; XXII. 13, 14, 15; XXXI. 1, 2, 3, 5; XXXIII. 1, 2; XXXIV. 2, 4, 6, 10, 11, 13; XLV. 3, 4, 6, 7, 8, 9, 10, 12, 14, 15; XLIX. 1, 5, 9; LV. 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 14, 16; LXV. 4. **Northumberland**, XIV. 8, 9, 10, 11, 14, 15, 16; XV. 9, 10, 13, 14, 15; XIX. 3, 6, 7, 9, 10, 12, 13; XX. 1, 2, 5, 7, 13; XXII. 2, 3; XXXI. 8; XXXII. 4, 7, 8, 15, 16; XXXIX. 3; CII. 11; CVII. 1; CXI. 3; XVII. 14. **Surrey**, VI. 8; XXII. 8, 14, 16; XXX. 1, 2, 5, 6, 7, 10; XXXVI. 2, 10; XXXVII. 6, 7, 12, 15; XLIII. 6. **Sussex**, XXI. 2, 5, 9, 13; XXV. 6; XXVI. 7; XXXVIII. 1; XXXIX. 13; LI. 12; LXIII. 2, 6, 7, 10, 11.

(*E. Stanford, Agent.*)

Germany. **Königl. Preuss. Landes-Aufnahme.**

Karte des Deutschen Reiches. Herausgegeben von der Kartogr. Abtheilung der Königl. Preuss. Landes-Aufnahme, 1897. Sheets: 481, Hildesheim; 482, Mayen. Scale 1 : 100,000 or 1·7 stat. miles to an inch. *Price* 1·50 *mark* each sheet.

ASIA.

Hong Kong. **Public Works Department.**

Plan of Victoria City, Hong Kong. Scale 60 ft. to an inch. Public Works Department, Hong Kong. 1897. 28 sheets. *Presented by H.M. Secretary of State for the Colonies.*

Sumatra. **Thomson.**

Kaart van het gebied Bezet in Groot-Atjeh met de nederzettingen Lepoeng en Lehoeng. Scale 1 : 40,000 or 2·1 stat. miles to an inch. By L. W. J. K. Thomson. J. Smulders & Co., The Hague, 1897. 2 sheets. *Presented by the Author.*

AFRICA.

South Africa. **Currie**

The Castle Line Map of South Africa. Scale 1 : 2,217,600 or 35 stat. miles to an inch. Donald Currie & Co., London, 1897. On rollers. *Presented by the Publishers.*

This is a general map of South Africa, on which all means of communication by road and rail are laid down. In addition to this, several items of useful information are given, such as the localities where certain minerals are found, the depth below the surface at which water can be reached, the annual rainfall, and navigable inland waters for the whole year, or for the rainy season only; there is also a table of distances between ports, and a map of Central Africa is shown as an inset.

Sudan. **Intelligence Branch, Topography.**

Map of the Soudan and Neighbouring country. Scale 1 : 1,520,640 or 24 stat. miles to an inch. Intelligence Branch, Quarter-Master-General's Department, Simla, 1897. *Presented by Intelligence Branch of India.*

Transvaal. **Regan**

Plan of the Witwatersrand Gold Fields. Scale 1 : 29,750 or 792 yards to an inch. By Wm. F. Regan, F.R.G.S. Issued by the London and Pretoria Corporation, 1897, London. *Price* 2 *guineas. Presented by the Publishers.*

On this plan are shown the positions and boundaries of the several mines on the Witwatersrand, and statistics are also given in tabular form of the Rand's gold yield from January, 1893, to August, 1897.

GENERAL.

Exploration. **Schrader.**

l'Année Cartographique. Supplément Annuel à toutes les publications de Géographie et de Cartographie, dressé et rédigé sous la direction de F. Schrader. Septième Supplément. Paris: Librairie Hachette et Cie, 1897. 3 sheets of maps and letterpress. *Price* 3 *francs.*

The first sheet of this useful atlas contains a map showing the route followed by MM. J. Chaffanjon, L. Gay, and H. Mangini across Mongolia; it also contains maps showing the route followed by Mr. C. E. Bonin in Eastern Tibet, Nansen's polar expedition, the correction of the arctic coast-line from observations of recent expeditions, and a population map of the Russian Empire for 1897. The second sheet contains maps showing the routes of M. de Foureau, 1894–95, in the Algerian Sahara; Prince D. Ghika's and Dr. D. Smith's explorations in Somaliland; Lieut. C. F. S. Vandeleur's surveys in Uganda and Unyoro; the course of the Niger from its mouth to Timbuktu, by Lieut. Hourst; and the Marotsi country from the sketch surveys of Captain Gibbons, Mr. B. C. Reid, and Captain Bertrand. The third sheet contains maps showing the mountain system of Venezuela, from the work of Dr. Seevers, 1896; a railway map of Mexico, 1896; a map of the Cordillera de los Andes showing the Puyehue pass; the course of the Rio Ronuro, Central Brazil, and the route followed by Hermann Meyer; and the southern portion of the territory of S^ta^ Cruz, in the Argentine Republic. The maps are accompanied by explanatory notes, which are printed on the back of them.

CHARTS.

Russian Charts. Chief Hydrographic Department, Ministry of Marine, St. Petersburg.

Charts and Plans published by the Chief Hydrographic Department, Ministry of Marine, St. Petersburg.

EUROPE.

No.

197 Nukke Vorm channel, published in 1897.
467 Index sheet of Maps and Plans of the Baltic sea, published in 1896.
468 The rocks of Abö:—No. 1, from Hangö to Chukan island, published in 1897.
212 The roadstead of Libau and port Emperor Alexander III., published in 1897.

The White and Arctic Seas.

471 Plan of the Ekaterinovskaya (Catharine) harbour, published in 1896.
472 Plan of the bay of Podpakhota, published in 1897.
474 Plan of the creek Ozerko, published in 1897 (Novaya Zemlya).
477 Plans of the bays of Teriberka, Porchnikha, and Rynda, published in 1897.
476 Plans of the bays of Paza, Bazarnaya, Finmanskaya, and Pechenga, published in 1897.
478 Plans of the bays of Korabelnaya, Keyskaya, Tsyn-Novolok, and Vaida, published in 1897.
459 Plan of the Kandalaiski roadstead, published in 1896.
432 Chart of Novaya Zemlya and the western part of the Kara sea, published in 1897.
446 Plan of Malo-Karmakul cantonment, published in 1896.
482 Plan of the bay of Belush with the creek Samoyed on Novaya Zemlya, published in 1897.
484 Provisional chart of the southern part of the gulf of Ob, published in 1897.
483 Provisional chart of the gulf of Ob and the bay of Yenisei, published in 1897. in substitute of No. 368.
485 Plans of the river Yenisei, from its entrance to Cape Gostinyi and Lukovaya narrows, published in 1897.

The Black Sea and the Sea of Azov.

453, A and B The bay of Karkinitzki, published in 1896.
1770 The creek and roadstead of Theodosia, published in 1896.
1768 From the mouth of the Dniester to the mouth of the Danube, published in 1897.
463 General chart of the sea of Azov, published in 1896.

The Caspian Sea.

1569 The bay of Astrabad and the island Bolshoi (Great) Ashur, in the Caspian sea, published in 1897.

North Pacific Ocean.

464 Index sheet of Peter the Great bay, published in 1897.
465 Index sheet of the sea of Japan and the Yellow sea, published in 1897.
466 Index sheet of the seas of Okhotsk and Bering, published in 1897.
1752 Peter the Great bay, published in 1897.
481 The bay of Slavyanski, published in 1897.

448 The western shores of the sea of Japan from the bay of St. Vladimir to the bay of America, published in 1896, a complement to the Map No. 1599.
460 Plans of the mouths of rivers and of creeks on the western shore of the sea of Japan, published in 1896.
470 The southern part of the strait of Tartary, published in 1897.
486, A and B Provisional chart of Lake Baikal, on two sheets, published in 1897.
Presented by the Chief Hydrographic Department, Ministry of Marine, St. Petersburg.

United States Charts. **U.S. Hydrographic Office.**

Pilot Charts of the North Atlantic and North Pacific Oceans for December, 1897. Published at the Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Canada. **Topographical Surveys Branch, Department of the Interior.**

Twenty-one Photographs of the Rocky Mountains, Canada. *Presented by the Topographical Surveys Branch, Department of the Interior, Ottawa.*

This is a very fine series of photographs, and contains the following characteristic views of Rocky mountain scenery:—

(1) Looking north from the summit of Mount Stephen; (2) The upper end of the first Bow Lakes—Mount Balfour is in the clouds; (3) From North Fork Station, looking north-west; (4) Looking west from the summit of Mount Stephen; (5) Looking up the Bow valley from the first mountain to the north of Mount Hector; (6) Mount Hector, looking down the Bow valley; (7) Mount Hector from the first mountain to the north; (8) From Slate mountains, looking west through the Kicking Horse pass; (9) Looking north-east from the summit of Mount Stephen—the Continental divide. (10) From North Fork Station, looking east; (11) From North Fork Station, looking to the south-east; (12) From the ridge south of Mount Hector; (13) Looking east across the north fork of Kicking Horse river from the saddle east from Emerald lake; (14) From the summit of Mount Stephen, Cathedral mountains in the foreground; (15) Looking up the Bow valley from Mount Piran, Mount Hector in the centre; (16) Looking north-east through the Howse pass; (17) Assistant J. R. Allen on Mount Stephen, looking north-east; (18) J. J. McArthur on the summit of Mount Stephen; (19) Looking south-west from North Fork Station; (20) From the summit of Mount Stephen. Looking east through the Kicking Horse pass; (21) Mounts Hector and Molar from the east.

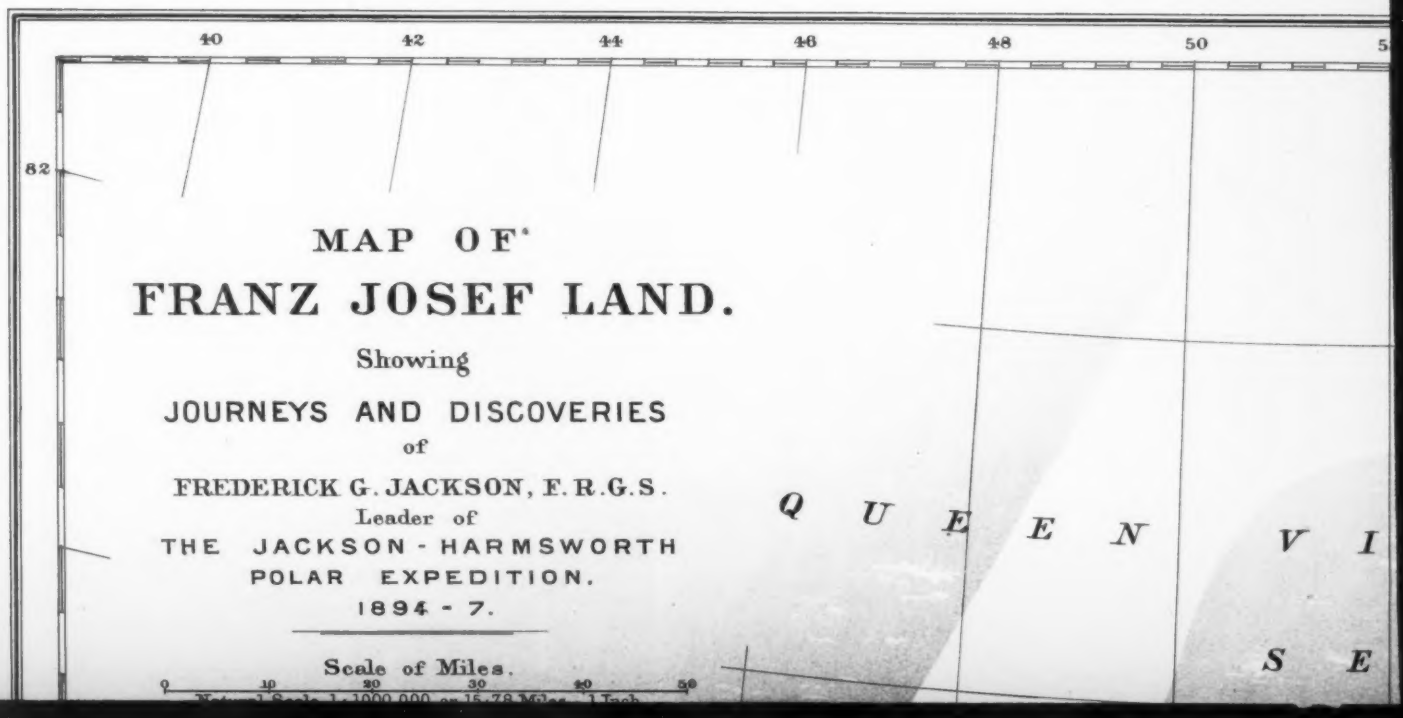
South Africa.

Twenty-seven Photographs of South Africa, including views of Pretoria, Johannesburg, Port Elizabeth, Natal, Kimberley, and Capetown. *Presented by F. Jeppe, Esq.*

As will be seen by the following list, this series contains views of many of the principal buildings and scenery of the Cape Colony, Natal, and the Transvaal:—

(1) Main street, Port Elizabeth; (2) Town Hall, Port Elizabeth; (3) Port Elizabeth from the bay; (4) Church square; (5) The Raadzaal, Pretoria; (6) Between the chains, Johannesburg; (7) Transvaal Mortgage Co.'s building; (8) Sylvan retreat; (9) West street, looking west; (10) Town hall, Durban; (11) Umgeni falls, Natal; (12) The Valley of a Thousand Hills; (13) Bird's-eye view of Durban; (14) Sorting the gravel for diamonds; (15) The morning market, Kimberley; (16) Pay-time in the compound; (17) The open kopje, Kimberley mine; (18) Open works, De Beer's mine; (19) Government House, Capetown; (20) Adderley street, Capetown; (21) The Garden's avenue, Capetown; (22) Parcel of diamonds classified for shipment; (23) Bird's-eye view of Capetown; (24) The Cape naval station, Simon's-town; (25) Commissioner street, from Eiksteiris buildings; (26) Chamber of Mines offices; (27) Wyneberg avenue, near Capetown.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.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MAP OF
FRANZ JOSEF LAND.
Showing
JOURNEYS AND DISCOVERIES
of
FREDERICK G. JACKSON, F.R.G.S.
Leader of
THE JACKSON-HARMSWORTH
POLAR EXPEDITION.
1894-7.
Scale of Miles.
0 10 20 30 40 50
Natural Scale 1:1000,000 or 15.78 Miles 1 Inch
QUEEN V I
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C. Sherard Osborne
C. Fligely
CROWN PRINCE RUDOLF LD.
C. Germania
C. Saulen
Teplitz Bay
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C. Rath
C. Aub
C. Brorok
C. Habermann
C. Schrotter
Hohenlohe
Coburg I.
C. Felder
C. Beaumann
Liv I.
Eva I.
Adelaide I.
Michael Sars Sound
HVIDTLAND
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F. S. Waller, F.R.G.S